

PEARSON EDEXCEL INTERNATIONAL AS LEVEL

# PSYCHOLOGY

Student Book 1

Karren Smith

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# ABOUT THIS BOOK

This book is written for students following the Edexcel International Advanced Level (IAL) Psychology specification. It covers the first year of the international A level qualification (AS level).

The book has been carefully structured to match the order of topics in the specification, although teaching and learning can take place in any order, both in the classroom and in any independent learning. This book is organised into two units (Unit 1: Social and cognitive psychology and Unit 2: Biological psychology, learning theories and development), each with two topic areas.

Each topic is divided into chapters to break the content down into manageable chunks. Each chapter begins

by listing the key learning objectives and includes a getting started activity to introduce the concepts. There is a mix of learning points and activities throughout. Checkpoint questions at the end of chapters help assess understanding of the key learning objective.

The content for Unit 1 is applicable for Paper 1 (Social and cognitive psychology) and the content for Unit 2 is applicable for Paper 2 (Biological psychology, learning theories and development). Knowing how to apply learning to both of these papers will be critical for exam success. There are exam practice questions at the end of each chapter to provide opportunity for exam practice. Answers are available on the Pearson International Schools website.

## Topic opener

Introduce each of the key topics within each unit of the specification.

## Learning objectives

Each chapter starts with a list of key assessment objectives.

**UNIT 1: SOCIAL AND COGNITIVE PSYCHOLOGY**

**TOPIC A**

**SOCIAL PSYCHOLOGY**

Social psychology looks at how our relationships with others affect our own behaviour. This topic examines how those in authority influence our behaviour and how being in a group can influence the way we act. Some of us will obey authority and go along with the crowd, while others will question and resist authority. This means that some people are influenced by others, but there are individual differences between us which may explain defiance.

This topic examines factors that influence our tendency to obey and conform. We often observe others in social situations and try to guess why they behaved that way. For example, you may witness your friend acting differently with their family than they do with their friendship group. This may be because their family expects good behaviour, but the friendship group has different expectations. Social psychology involves a rigorous and scientific investigation of these attitudes and behaviours, using experiments and surveys to establish firm conclusions.

In this topic, you will also learn about specific research that has been conducted in social psychology. Finally, there will be the opportunity to conduct your own research into a topic relevant to this approach.

## 2 TOPIC A: SOCIAL PSYCHOLOGY

### CHAPTER 1 OBEDIENCE

#### LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand and evaluate theories of obedience, including agency theory and social power theory
- describe and evaluate Milgram's research into obedience
- explain factors affecting obedience and dissent, including individual differences, situation and culture

#### GETTING STARTED

Imagine that you are in your school library studying for an important examination. You are sitting silently alongside other students who have exam time. The head librarian, a respected staff member at your school, approaches your table and asks you and the other students to leave your seats immediately as there is a special guest speaker who needs the library to give a lecture. You would rather continue to work in the library because it is the only quiet space in school and the exam is very important.

In small groups, discuss how you might react when the librarian requests that you leave. What factors would make you leave the library and what factors would make you stay? Compare your discussion to others in the class.

#### KEY TERMS

**conformity:** a form of social influence where our opinions, beliefs and/or behaviour are influenced by a majority

**minority influence:** a form of social influence where the opinions, beliefs and/or behaviour of the majority are influenced by a minority (individual or small group)

**obedience:** complying to the orders of an authority figure

**social influence:** how our opinions, beliefs and behaviour are influenced by the real or imagined pressure of an individual or group

#### THE ORIGINS OF SOCIAL PSYCHOLOGY

Social psychology developed from a group of people working in Europe in the mid-19th century, who were concerned with understanding the collective or group mind. In 1895 a French writer, Gustave Le Bon, observed that crowd-displaced mob-like behaviour because individuals within it changed their behaviour because they were part of a group. The idea that an individual's behaviour can be changed by the presence of others is central to social psychology today.

The rise of experimental social psychology can be attributed to Floyd Allport (1894). His book outlined a manifesto for social psychology that argued for an experimental approach, leading to laboratories' investigation of social behaviour.

Today, social psychology investigates a range of social behaviours and attitudes such as persuasion and attitude formation, **social influence**, aggression and group behaviour. This topic focuses on **obedience**, **conformity** and **minority influence**.

#### OBEDIENCE

Obedience is a form of **social influence** where the behaviour of an individual is influenced by a real or imagined pressure from another. Obedience can be defined as compliance to the real or imagined demands of an authority figure. Yielding to these demands is considered to be obedient, while rejecting the demands is known as dissent or resistance to authority.

In our everyday lives we obediently follow the instructions of teachers, employers, police officers and the rules of society. Such obedience can prevent accidents and results in social order most of the time. However, there are times when obedience has led to horrific consequences. Notably, many atrocities that have been committed against innocent people have been the result of unquestioning obedience. During the Second World War, the Nazi party instructed the systematic killing of millions of Jewish people. This could only have been achieved through the collective obedience of many German soldiers who carried out these orders.

#### AGENCY THEORY OF OBEDIENCE

Stanley Milgram wanted to investigate tendencies that could explain the atrocities committed during the Nazi control of Germany, in particular the defence claims made by many senior Nazi officers.

## Key terms

Key subject terms are given in bold blue font within the main text and a definition is provided.

## Getting started

An introduction to the chapter, letting you think about the concepts you will be introduced to. Questions are designed to stimulate discussion and use of prior knowledge. These can be tackled as individuals, pairs, groups or the whole class.



Each chapter includes activities to embed understanding through case studies and questions.

Questions to check understanding of the key learning points in each chapter. These are NOT exam-style questions.

Tips give practical advice and guidance for exam preparation.

**Exam practice**  
Exam-style questions are found regularly throughout. They are tailored to the Pearson Edexcel specification to allow for practice and development of exam writing technique.

Relevant exam questions have been assigned key skills, allowing for a strong focus on particular academic qualities. These transferable skills are highly valued in further study and the workplace.

Exam-style questions are found regularly throughout. They are tailored to the Pearson Edexcel specification to allow for practice and development of exam writing technique.

These sections focus on the issues and debates outlined in Unit 4 of the specification. They are included in each of the topic areas and are designed to highlight the issues facing psychology today.

These sections provide opportunity to explore an aspect of psychology in more detail to deepen understanding.

# SPECIFICATION COVERAGE

## UNIT 1

### TOPIC A SOCIAL PSYCHOLOGY

### SPECIFICATION POINTS COVERED

Chapter 1: Obedience	1.1.1–1.1.3
Chapter 2: Conformity	1.1.4–1.1.5
Chapter 3: Minority influence and individual differences	1.1.6–1.1.7
Chapter 4: Methods: Self-reporting data and sample selection and sampling techniques	1.2.1–1.2.5
Chapter 5: Methods: Analysis of quantitative data and ethical guidelines	1.2.6–1.2.9
Chapter 6: Studies	1.3.1–1.3.2, 1.3.4
Chapter 7: Practical investigation	1.4.1

### TOPIC B COGNITIVE PSYCHOLOGY

### SPECIFICATION POINTS COVERED

Chapter 8: Memory: The multi-store model	2.1.1
Chapter 9: Memory: The working memory model	2.1.2
Chapter 10: Memory: Reconstructive memory	2.1.3
Chapter 11: Methods: Designing and conducting experiments	2.2.1–2.2.11
Chapter 12: Methods: Data analysis and case studies of brain damaged patients	2.2.12–2.2.13
Chapter 13: Studies	2.3.1–2.3.3
Chapter 14: Practical investigation	2.4.1

**UNIT 2****TOPIC C BIOLOGICAL PSYCHOLOGY****SPECIFICATION POINTS COVERED**

Chapter 15: Structure and function of brain regions – aggression	3.1.1–3.1.3
Chapter 16: Body rhythms	3.1.4–3.1.6
Chapter 17: Methods	3.2.1–3.2.7
Chapter 18: Studies	3.3.1–3.3.4
Chapter 19: Practical investigation	3.4.1

**TOPIC D LEARNING THEORIES AND DEVELOPMENT****SPECIFICATION POINTS COVERED**

Chapter 20: Classical and operant conditioning and social learning theory	4.1.1–4.1.3
Chapter 21: The role of the unconscious in personality development	4.1.4
Chapter 22: Therapies/Treatments	4.1.5–4.1.6
Chapter 23: Methods	4.2.1–4.2.8
Chapter 24: Studies	4.3.1–4.3.4
Chapter 25: Practical investigation	4.4.1



# ASSESSMENT OVERVIEW

The following tables give an overview of the assessment for this course. You should study this information closely to help ensure that you are fully prepared for this course and know exactly what to expect in each part of the assessment.

Paper 1	Percentage of IAS	Percentage of IAL	Mark	Time	Availability	Structure
Social and cognitive psychology WPS01/01	40%	20%	64	1 hour and 30 minutes	January and June	<p>There will be three sections:</p> <p>Section A: Social psychology, totals 26 marks and comprises short-answer questions and one eight-mark extended open-response question.</p> <p>Section B: Cognitive psychology, totals 26 marks and comprises short-answer questions and one eight-mark extended open-response question.</p> <p>Section C comprises one 12-mark extended open-response question on either social or cognitive psychology.</p>



Paper 2	Percentage of IAS	Percentage of IAL	Mark	Time	Availability	Structure
Biological psychology, learning theories and Development WPS02/01	60%	30%	96	2 hours	January and June	<p>There will be three sections:</p> <p>Section A: Biological psychology, totals 34 marks and comprises short-answer questions and one eight-mark extended open-response question.</p> <p>Section B: Learning theories and development, totals 34 marks and comprises short answer questions and one eight-mark extended open-response question.</p> <p>Section C comprises one 12-mark and one 16-mark extended open-response question. The 12-mark question covers either biological psychology or learning theories and development and the 16-mark question covers both biological psychology, and learning theories and development.</p>

# INTRODUCTION TO PSYCHOLOGY

Psychology is defined as the science of mind and behaviour, but for any new student of psychology it is a different way of thinking about and understanding the world. Throughout this course you will explore how different psychologists view and explain a variety of human behaviours. You will learn the skills required to undertake psychological research, and the skills required to evaluate theory and research.

This section covers:

- approaches in the study of psychology
- theory, study and methodology
- common themes
- understanding how to evaluate
- applying your knowledge
- methods.

## APPROACHES IN PSYCHOLOGY

Many different approaches are taken in psychology to understand and study human behaviour. This can be a tricky concept as many subjects that you might have studied at GCSE involve learning just one answer, one fact or one perspective about a given topic.

However, in everyday life there can be many different ways of thinking about the same situation or event. For example, many different people might be interested in a garden: such as a biologist, an artist, a geographer, a gardener and a child. The garden remains the same but the individuals each have a different perspective on what the garden means to them and will have different interests in it. A biologist would be interested in the ecosystems that exist in the garden borders; the geographer might be interested in the gradient of the landscape; a child would focus on what games can be played in the space; form and colour would be important for the artist; and a gardener would be concerned with the plants and vegetables that are grown there. In the same way, psychologists have different perspectives on what it is important to understand and study about the human mind and behaviour.

Psychologists also differ in the way that they go about studying human behaviour. Using the garden metaphor again, a gardener would use tools, such as a fork and spade, the artist would use an easel and brushes and a biologist would throw a quadrat to measure quantities of species in an area. Psychologists also use different tools, referred to as research methods, to study human mind and behaviour; an experiment can be set up to test mental processing, an observation can be conducted to observe playground behaviour and a case study can be used to study an individual in detail. The research methods used are often associated with the approach taken to understand human behaviour.

As you work through the course, you will examine these different approaches and the methods used to investigate humans and animals. It is important to learn the key features of each approach in order to understand their perspectives on psychology, and the research methods used to investigate mind and behaviour.

Table 1 shows how each approach views behaviour and the methods of investigation typically used.



TABLE 1: APPROACHES IN PSYCHOLOGY

Approach	Perspective taken	Methods of investigation/ methodologies
Social approach/social psychology	Understands human behaviour by examining relationships between individuals, groups, societies and culture. Social psychologists are interested in human behaviours such as obedience, conformity and minority influence.	Although they use many methods, such as experiments, observations and correlations, this book draws attention to the self-report/survey methods of the questionnaire and interview.
Cognitive approach/cognitive psychology	Understands human behaviour as a result of the way we process information. Cognition is our awareness and understanding of the world. Cognition therefore affects the way we respond to an event. Cognitivists are interested in studying topics such as memory, attention, language and intelligence.	Cognitive psychologists typically use experiments to investigate human mental processing. They also use case studies of brain-damaged patients to understand how injury can be linked to cognitive impairments, such as dementia.
Biological approach/biological psychology	Explains human behaviour as resulting from biological mechanisms such as the nervous and endocrine systems and ultimately genetics. Biological psychologists are interested in many types of normal and abnormal behaviour but this specification focuses on understanding aggression and body rhythms.	Biological psychologists often study the behaviours that would be unethical to manipulate or create. They use correlations to examine relationships between variables, such as aggression and hormones. They also use scientific methods such as brain scans to identify what parts of the brain are responsible for behaviours. Twin and adoption studies are used to investigate genetic inheritance.
Learning approach/learning theories	The learning approach, referred to as behaviourism, explains human behaviour as a product of a learning experience. We acquire behaviour through observation and imitation, association, and the consequences of reward and punishment.	Learning theorists/behaviourists tend to use animal experiments to understand the building blocks of learning in simple species, although human experiments have been conducted where a new behaviour is deliberately manipulated and studied. This book also focuses on the observation research method used to examine different behaviours.

These approaches vary considerably in their perspectives on the causes of human behaviour, the focus of their interest and the way in which they conduct investigations. But the different perspectives do not necessarily mean that there is only one right answer or explanation. We must consider instead the relative strengths and weaknesses of each perspective and the evidence they use to support their views.



## APPLICATIONS IN PSYCHOLOGY

In the second year of your course you will be required to apply your knowledge of approaches within specific applications of psychology. Applications are areas of psychology or specialisms, such as developmental psychology, health psychology, criminological psychology and clinical psychology. Within these applications you will come across the different approaches and methodologies again. You will have to use your underpinning knowledge of the approaches studied in the first year of the course and apply it to the context of your chosen application and clinical psychology.

## THEORY, STUDY AND METHODOLOGY

When you study psychology, you will see that there are various components that build up to the bigger picture of understanding human nature. These components can be broadly divided into theory, research study and methodology.

### WHAT IS A THEORY?

Psychology is concerned with explaining human behaviour. It is not possible to explain all human behaviour in totality, so psychologists tend to focus on specific aspects of mind and behaviour that interest them. For example, cognitive psychologists cannot explain all human cognition, as cognition itself involves memory, attention, language, intelligence and problem solving, etc. So a cognitive psychologist may focus their attention on one aspect of cognition, such as memory, and try to explain how memory works. Their explanation is called a **theory**. A theory is an explanation or set of ideas on how something works or, in the case of psychology, how some aspect of mind and behaviour can be explained, and how it can be used to predict future behaviour. In the context of being a science, psychological theories (as with any theory of the natural sciences) cannot be proven or stated as fact, but with supporting evidence they can become 'accepted' theories.

You need to be able to describe, evaluate or use your knowledge of theories. To *describe* a theory involves straightforward recall of the main concepts and ideas that need to be written in logical and coherent prose. To *evaluate* a theory you will need to explain how useful the theory is at helping us to understand the behaviour it claims to explain. To do this you will need to consider the strengths and weaknesses of the theory itself and any research evidence from studies that can be used to support or refute (or contradict) the theory. To *use* the theory requires an application of knowledge to explain a given scenario that is more than simply describing the theory. You will need to consider and select which concepts and ideas within the theory itself are important and can be linked to the scenario you are given and then mould them into an explanation.

### WHAT IS A STUDY?

A psychologist cannot just claim to have a theory or explanation without the evidence to support it. Psychologists gather this evidence by conducting a research **study** on human or animal participants to demonstrate how their theory might work. Studies are practical investigations that are conducted, analysed, written up and subsequently published in journals to build up a bank of knowledge concerning an aspect of human cognition or behaviour.

Research studies can take many different forms that adopt differing methodologies: clinical trials, experiments, observations, case studies and surveys, among others. They can be conducted over a short or long period of time and can differ in the type of data gathered.

You will need to be able to describe, evaluate and use your knowledge of research studies. To describe a study you will need to show knowledge of the whole study: the name(s) of the researcher(s), the aim of the investigation, the methodology used (including research method, procedure, sample, design, apparatus, controls, variables and ethics), the findings and conclusions drawn. To evaluate the study it is important to have a range of points to ensure

#### KEY TERMS

**study:** a practical investigation conducted by a researcher

**theory:** a set of ideas that are used to explain a behaviour



that both strengths and weaknesses of the research are included. You may be asked to draw on your knowledge of the study to explain a particular issue, or you can use the research study as evidence to evaluate a particular theory. To use the study as evidence for or against a theory, you only need to refer to the findings and conclusions to explain why it backs up or refutes a theory.

#### EXAM TIP

You will have to learn classic and contemporary studies in detail through this course. When revising these classic and contemporary studies it is important learn them in detail. You should aim for the following:

Aim(s): 2 marks – one detailed description for each aim

Sample: 2 marks – the size and composition of the sample

Procedure: 4 marks – four clear description points about how the study was conducted

Results: 3 marks – three clear description points about what the researchers found

Conclusion(s): 2 marks – one detailed description for each conclusion drawn.

You will also learn about many other studies which will form part of your evaluation of a theory. You do not need to learn these in the same depth, but you do need to clearly know what they did and what they found. Importantly, you should know how each study relates to the theory you are using it to evaluate.

### WHAT IS METHODOLOGY?

Broadly speaking, methodology refers to a set of principles adopted by an approach or type of procedure used to conduct a research study. Although there are broader definitions of the term within philosophy and other disciplines, in psychology it tends to refer to the type of scientific procedures adopted to study a particular phenomenon. In psychology we classify scientific procedures and label them as research methods. The research method (or methodology) chosen to investigate depends on the nature of what is being investigated and the approach taken by the psychologist. For example, a cognitive psychologist would prefer to use laboratory experiments, case studies of brain-damaged patients, neuroimaging and observations as research methods because they are useful to study aspects of cognition, such as memory. A social psychologist, however, would prefer to use field experiments and observations to study human social interaction or surveys to uncover attitudes about different social groups.

Methodology can also refer to the way in which research was conducted: the procedure used in an investigation.

You will need to be able to describe, evaluate and use your knowledge of methodology throughout the course. Describing the methodology used involves outlining its key features, such as how and when it is likely to be used and the processes involved in the particular method. Evaluation will involve explaining the strengths and weaknesses of the methodology in achieving useful results; this evaluation tends to involve weighing up key elements or features of science such as control, objectivity, replicability and validity. You can also examine the ethical implications of each research method. Using your knowledge of methodology will involve applying your understanding of methods to a novel situation, perhaps to design an investigation.

### WHAT ARE ISSUES AND DEBATES?

Issues and debates form the synoptic element of assessment and are directly tested in Unit 4 as a synoptic question worth 20 marks. However, knowledge of issues and debates can also be used to evaluate psychological research, methodology and theory throughout the other units.



Issues and debates are considered to be synoptic elements of psychology because they run through the whole course. Understanding issues and debates gives you a greater understanding of psychology as a whole discipline. They include the following.

### ETHICAL ISSUES

Ethical issues in research (human and animal) refer to the guidelines that protect participants involved in research and ensure their psychological and physical safety, as well as their wellbeing. Ethical issues apply directly to research studies that are conducted on humans and animals. It is important not only to know the ethical guidelines, but also whether or not research has satisfied these guidelines, the reasons for not adhering to the guidelines and the consequences for the participants involved. You will also be conducting your own practical investigations throughout the course to gain experience of implementing ethical guidelines first hand, and you will need to be aware of the importance of adhering to them.

It is important to remember that ethical guidelines are not violated by psychologists without good reason; perhaps because of the nature of the topic being investigated or to maintain the integrity of the research. Knowing which guidelines are an issue for a research study is important, but you should also know the reasons behind decision-making regarding ethics.

### PRACTICAL ISSUES IN THE DESIGN AND IMPLEMENTATION OF RESEARCH

Practical issues refer to how research is planned and conducted, and the methodological considerations that need to be made. When a researcher designs a study there are many practical issues they have to consider, including the choice of method, sampling technique, experimental design, controls to implement, apparatus and operationalisation of variables. These considerations need to be made to fulfil specific criteria, such as generalisability, validity, reliability and ethical considerations. Throughout the course you will learn about practical issues in designing psychological research and you will also evaluate classic and contemporary studies using your knowledge. All of this knowledge can be used throughout the course and then drawn together to answer the issues and debates question in Unit 4.

### REDUCTIONISM VERSUS HOLISM WHEN RESEARCHING HUMAN BEHAVIOUR

**Reductionism** is an approach in psychology that relies on the simplifying of a complex phenomenon. Human minds and behaviour involve undoubtedly complex processes that can be difficult to understand and study without first breaking them down into smaller, simpler components in order to explain them. This is known as reductionism. Reductionism can be desirable as it makes a phenomenon easier to isolate, study and understand, according to the scientific process. However, it can be argued that reductionism inherently oversimplifies, fragments and ultimately limits our understanding of complex human behaviour. **Holism** is a different perspective that stresses the importance of understanding mind and behaviour as a whole, rather than breaking it down into constituent parts to study in isolation. A holistic approach involves examining behaviour on biological, psychological, social and cultural levels, to understand how each of these factors interact and influence how we think and behave. Taking a holistic approach can be useful and can give us a better understanding when examining behaviours with many influences, but it can make it difficult to isolate which factor is the most important in determining a behaviour.

#### KEY TERMS

**holism:** studying human mind and behaviour as a whole using different levels of explanation

**reductionism:** simplifying or fragmenting a phenomenon

### WAYS OF EXPLAINING BEHAVIOUR USING DIFFERENT APPROACHES, MODELS OR THEORIES

It is not uncommon to find two or more approaches or theories that could be used to explain the same phenomenon. Comparisons of explanations of behaviour using different approaches or theories involves examining opposing ideas. Often these approaches or theories use different levels of explanation or take a particular perspective within their explanation. For example, some psychological theories explain aggression as resulting from brain functioning or structures of the brain, whereas other approaches focus on how we learn aggression. It is important to



understand what perspective each approach or theory takes in order to compare the strengths and limitations of each idea as an explanation for a particular behaviour.

## THE ISSUE OF PSYCHOLOGY AS A SCIENCE

Psychology as a science is a long-standing debate that will be discussed in more depth throughout the course. Psychologists who take a more scientific approach to theory research may argue that psychology is a science but there are aspects of psychology which make it more difficult to meet the criteria of being truly scientific. You may be asked to judge whether a theory, research study or particular methodology is scientific, so it is important to understand what criteria are used.

### KEY TERMS

**empiricism:** knowledge can only be gathered through sensory experience. For example, empiricists would argue that you cannot infer that it is raining outside just because you can see people putting up their umbrellas; you can only establish that it is raining by going outside and feeling the rain on your skin

**objectivity:** impartiality and value-free judgements should be made by the researcher. They should not impose their own opinions on the findings of research

Science tends to follow the hypothetico-deductive method to ensure that only testable ideas are researched and that evidence can be gathered to support or disprove these ideas. Science also follows an empirical tradition. **Empiricism** is a way of thinking and states that only true knowledge can be gathered directly through the senses and should not be simply inferred through logical reasoning (guesswork). Science also involves meeting the criteria of control, **objectivity** and replication, among others. You can use these criteria to judge research and methodology to determine whether they can be considered scientific or not.

You will be asked to judge whether an approach or research can be considered to be scientific. Start by making a list of features considered to be scientific (empiricism, objectivity, and so on) and then form a judgement about the approach or research by whether or not it matches each criterion. It is also useful to understand that, although being scientific is considered to be a strength, it can be a limitation in psychology. It can prevent certain research from being undertaken because it does not meet the strict criteria of science, so that some research is not conducted in psychology because it may lack credibility. It is also argued that it is not appropriate to study human behaviour as one would study chemicals or plants in strictly controlled conditions, because human behaviour does not exist within an experimental vacuum. Applying science to the study of psychology can be seen as overly mechanistic and highly reductionist. Others argue that it is impossible for psychology, the study of humans, to meet the criteria of science because we can never be truly objective and it ignores the element of consciousness that makes us human.

## CULTURE ISSUES IN PSYCHOLOGICAL RESEARCH

Culture is an important issue in psychology because much psychological research is conducted in industrialised Western societies so that this view can be over-emphasised within current psychological thinking. This results in culture bias in research which can only therefore be used to explain the behaviour of the culture in which the research has been conducted. When judging the issue of culture bias it can be useful to examine the culture in which the research has taken place, the type of participants involved, the tools used to investigate and the way in which the outcomes of the research are used – do they limit the findings to the culture and sample used, or do they make assumptions about the universality of behaviour?

Ethnocentrism is where we form judgements about other cultures based on culturally biased research. When judging research to be ethnocentric it is important to understand the implications of applying findings to other cultures.

## GENDER ISSUES IN PSYCHOLOGICAL RESEARCH

Gender is an issue in psychology when research either exaggerates differences between men and women (alpha-bias) or minimises them when differences do exist (beta-bias). Alpha-bias is more common and can be found in many areas of psychology. Evolutionary psychology, for example, highlights differences between men and women in terms of physical strength, prowess and dominance. Alpha-bias does tend to support the idea of men being superior to women; however, Bowlby's original theory of attachment (see Topic E) regarded women as more



important in maternal care. It is important to recognise that alpha-bias can often support and perpetuate gender stereotypes that are oversimplified and often exaggerated by a tendency to only publish literature that has found a significant difference rather than no difference at all (null effect).

Beta-bias is when research minimises differences between men and women, which would be a generally fair conclusion based on the fact that there are more psychological similarities than differences between women and men. However, a problem occurs when the research is conducted primarily on male participants but purports to explain the behaviour of both men and women equally. Milgram, for example (see Topic A), conducted much of his research into obedience on men (he only tested 40 women), yet his conclusions were aimed at explaining all human obedience, in men and women alike. This demonstrates an **androcentric** bias in research.

#### KEY TERM

**androcentric:** research representing a male point of view

When considering gender bias it is useful to know how many men and women were tested in the original research and whether the findings of the research suggest a universal human characteristic. It is also important to question statements that seem to categorically suggest that men and women are different in a psychological dimension.

### THE ROLE OF BOTH NATURE AND NURTURE IN PSYCHOLOGY

This is the debate in psychology about whether psychological characteristics are a product of genetic factors or environmental influence. The former suggests that we inherit genes that determine our biology and psychological characteristics, and as such are predetermined and unavoidable. The latter emphasises the role of environmental influence on the development of psychological characteristics, such as upbringing, education and experiences. Historically the nature-nurture debate saw each standpoint as exclusive, but today we generally accept that we are a product of both nature and nurture in interaction with one another through the course of development both before and after birth. This can simply be represented as a nature-nurture continuum. However, it is important to remember that the debate today is not about how much nature or nurture has an influence, but about how nature and nurture interact to influence the psychological characteristics we possess.

### AN UNDERSTANDING OF HOW PSYCHOLOGICAL KNOWLEDGE HAS DEVELOPED OVER TIME

Understanding the historical situation in which an approach, theory or research has been developed or been a dominant way of thinking is important in developing a critical understanding of psychology. This is not simply about learning dates; it involves understanding the time in which knowledge has been developed and the implications of this knowledge at that point in history. For example, psychodynamics is regarded today as the least scientific of the approaches in psychology. It was developed by one of the founding fathers of psychology, Sigmund Freud, at the beginning of the 19th century. However we can begin to understand that the methods that Freud employed and his explanation of human behaviour were of the time and a result of the techniques that were available. Some knowledge is specific to its time, some still as relevant today, and some has contributed to the development of new knowledge.

### THE USE OF PSYCHOLOGICAL KNOWLEDGE IN SOCIETY

Psychological knowledge ultimately has practical use in society. The application of psychological knowledge is far reaching and touches on many aspects of our everyday lives, and in professional and clinical settings. For example, cognitive research has been used to help us revise for exams or tests more effectively, to inform police interview techniques and to help people with dementia who suffer memory loss. Learning theories have been used to reward good behaviour in classrooms, control the behaviour of prisoners and to help people with phobias. It is important that you know how psychological knowledge is applied in society and also whether its application is useful or not.



## THE USE OF PSYCHOLOGY IN SOCIAL CONTROL

The issue of social control in psychology concerns how knowledge derived from psychological research can be used to regulate, or control, people's behaviour. Although psychological knowledge can be used to benefit society or an individual, it can have certain social and moral implications as it can involve or imply direct behaviour manipulation. The implications for social control can be obvious in a clinical setting, because psychological therapies such as drug treatments for mental health issues involve altering behaviour so an individual can integrate better into society. However, some psychological knowledge has less obvious social control implications. Aversion therapy, for example, has social implications because it can be forced on individuals to make them conform to social expectations and values. Behaviourism is an approach in psychology that assumes that behaviour can be directly manipulated by environmental influences. Operant conditioning is a behavioural theory that describes behaviour as being a product of its consequences; reward or punishment. This may sound innocuous, but ultimately it can be considered a form of social control as it has the potential to directly alter the behaviour of one person by another.

It is also important to recognise the social and moral implications of psychological knowledge as it is used to regulate groups in society. For example, Bowlby was a developmental psychologist who believed that periods of separation between a child and its mother could have emotional implications on the bond formed and the child's subsequent emotional development. Following the Second World War, this knowledge was used to encourage the female workforce back into domesticity, despite employment being liberating for women across the country. It also ensured that the returning soldiers could regain jobs that had previously been taken by women. Ultimately this psychological knowledge had social implications for the shape of society and for the position of women within it.

## ISSUES RELATING TO SOCIALLY SENSITIVE RESEARCH

Ethical issues are concerns that affect how a participant is treated during the research, but sometimes psychological research has implications beyond the research conditions. Research that has negative implications for the individual or group they represent beyond the confines of a study is considered to be socially sensitive research. This may mean that the research may reflect negatively on people as individuals or may impact negatively on their life, their family, society, profession or the culture to which they belong. Essentially, socially sensitive research puts people at risk.

The problems associated with socially sensitive research are addressed in the British Psychological Society's Code of Human Research Ethics (2014) under the principles of scientific integrity and social responsibility. These principles state that research should be planned, conducted and reviewed in a way that considers how the knowledge gained may have the potential to cause harm, and that the outcomes of research should be used for the 'common good'. In fact, socially sensitive research is an integral theme within the code to ensure that risk of harm is minimised for the individual, and for the groups and communities to which they belong.

It is also of concern that socially sensitive outcomes may not be foreseen by researchers or that the research may only become socially sensitive if the knowledge was misused afterwards. However, avoiding socially sensitive research may mean that important topics of legitimate concern to the discipline of psychology and to society as a whole are overlooked. Some researchers avoid controversial research because they may be vulnerable to criticism or harassment. However, psychology has a moral obligation to conduct socially sensitive research, not avoid it, in order to advance our understanding of human behaviour and be able to offer informed solutions.



## KEY TERMS

**ecological validity:** the ability to generalise the findings of experimental research to situations beyond the laboratory

**generalisability:** the ability to apply findings to other people, situations and contexts

**operationalisation:** defining the variables specifically so that they are directly tested

## COMMON THEMES

Throughout the whole course, you will be expected to comment on the credibility, validity, reliability, **generalisability**, objectivity/subjectivity of theory and research. Therefore it is useful to familiarise yourself with these issues as soon as possible.

## OBJECTIVITY/SUBJECTIVITY

A key feature of science is objectivity, that is, research is value free and not contaminated by personal opinion (subjectivity). A researcher should be detached and impartial in the interpretation of information gained during an investigation.

A useful example of subjectivity and objectivity is to consider the length of an object. If you ask people to estimate the length of an object, it is likely to vary between individuals because it is their own personal opinion – this is known as subjectivity. However, if you give people a ruler and ask them to measure the length of an object, they are all likely to say the same length because the tool that they have used to measure length is objective. In psychology some methods are more objective than others, but it could be argued that no method can be purely objective because all require an element of interpretation.

The analysis of interview data, observations and other qualitative methods are more subjective because a researcher has to interpret and draw conclusions from data that are more likely to be affected by personal opinion. Similar to using a ruler, objectivity is best achieved by clear **operationalisation** of measurement, that is, defining exactly what is going to be measured and in what way it is to be recorded. In an observation, for example, making clear exactly what behaviours are to be recorded will improve objectivity; a researcher who is looking for how many times a door is opened for someone by another person will be more objective than a researcher looking for polite behaviour, because what constitutes polite behaviour is open to interpretation.

## GENERALISABILITY

Generalisability refers to the extent to which the findings of research can be applied to other people and contexts, other than the ones directly involved in the research itself. **Ecological validity** is a type of generalisability which questions the extent to which we can generalise from an experimental situation to a natural setting. When we conduct research we cannot investigate everyone, so it is done on a sample of the population. For example, if we conduct research on university students, would these findings also apply to non-university students – the general population?

## RELIABILITY

Reliability refers to the consistency of research findings. In order to establish reliability, research needs to be replicated many times to ensure that the outcome was not a one-off. A one-off finding may be because of a methodological issue, subjectivity or that an unstable characteristic is being tested.

## VALIDITY

Validity is about whether the research is measuring what it intends to measure. For example, if you conduct an IQ test, you want the outcome of the test to accurately reflect the concept of intelligence. Validity is often compromised by poor operationalisation of what is being measured. For example, if you are intending to measure the aggression of children in a playground and you operationalise aggression as pushing, you may find it is not a valid measure of aggression if the children are playing tag, a game where children are supposed to push each other.

## CREDIBILITY

Credibility is a broad definition given to the trustworthiness of psychological research and the knowledge gained from such research. Credibility is based on a range of factors such as the scientific method, objectivity, reliability and validity of research. The credibility of published psychological research is largely assured by the process of peer review.



## EVALUATION SKILLS

In psychology you will need to learn how to adopt a critical approach to both psychological theories that have been proposed and psychology research that has been conducted. Being critical involves an awareness of the strengths and weaknesses of an argument or investigation, and an appreciation of the credibility of a theory or study. This critical approach will take some time to develop fully, but there are concepts that can be considered when evaluating psychological research.

### EXAM TIP

When evaluating theories and studies, it can be easier to write about the weaknesses rather than the strengths, but both must be considered fully for a balanced evaluation. It is important that you don't just list strengths and weaknesses unless you are asked to. Often a weakness can be countered by a strength or justification.

Learning how to evaluate effectively will help develop your skills without having to remember the precise evaluation for each individual study. However, it is important not to write a generalised evaluation: it needs to be tailored to the study or theory you are evaluating. For example, do not just say that the study was conducted in a laboratory, so was not like real life. Instead detail how the laboratory conditions do not reflect real life for the study, what controls were used that would not be found in an everyday context and, most importantly, what the implications are of these being unlike real life.

## EVALUATING PSYCHOLOGICAL THEORIES

If you were told that eating five apples a day made you healthy, would you believe it? Many people would. But as a psychologist you need to think critically about the claim, or theory, that eating five apples every day makes you healthy. There are a series of questions you could ask yourself.



▲ Could you test the claim that eating five apples a day makes you healthy?

- Is there any supporting evidence that eating five apples a day makes you healthy? In psychology you cannot make claims unless you have the evidence to back them up. Psychological investigations provide support for theories if they test them and find them to be correct. You should use psychological evidence when evaluating a theory to ensure its credibility. Without evidence, the theory is simply speculation. There is actually no evidence to suggest that eating five pieces of fruit and vegetables a day makes you healthy – how would anyone ever test this theory anyway?
- What kind of evidence is being used to support the theory? If there is evidence to support a claim, what sort of evidence is it? If the evidence comes from anecdotal reports of people claiming to be healthy because they eat five apples a day, you need to question the credibility of these reports. If the support for the claim comes from scientific research then you can be more certain that the evidence is credible.
- Is there any contradicting evidence for apples making you healthy? If unhealthy people eat apples, this may provide some counter-evidence for the claim. Again, the credibility of this evidence should be assessed. If the unhealthy people who eat apples also eat five bags of chips a day, this may discredit the evidence.
- Is the claim that eating apples makes you healthy useful in everyday life? You could certainly claim that it would do no harm, and even introduce healthy snack times to schools or promote free fruit in fast-food restaurants. Therefore it would have useful everyday applications if found to be a true claim.



- Are there any different explanations for being healthy – is it a valid claim? An alternative explanation could be that people who eat apples are more food conscious generally, so have a healthier diet. This would seem a better explanation than apples making you healthy and is probably more grounded in truth.
- Is there anything that the theory fails to explain? Well, the apple claim cannot explain why people who eat five apples a day become unwell. This could not be predicted or explained by the claim, therefore it does not take into account why some people who eat apples are healthy and some people are not.
- Is it possible to test the theory that apples cause healthiness? The simple answer is no, this would not be practical or reasonable, you could not restrict a person's diet for an extended period of time (particularly not on apples alone), nor could you control everything else they ate, the amount of exercise, stress at work or school, or indeed any other variable likely to impact on their healthiness.
- Is the theory socially sensitive? That is, does it have a negative effect on the people involved or affected by the claim? Although the apple claim is unlikely to adversely affect anyone, an extreme view might be that it makes a judgement and implies that unhealthy people are responsible for their own health issues, or that people who cannot afford to buy lots of apples feel inferior to those who can. These are extreme viewpoints but the issue here is that, when a theory is proposed, it can have a negative effect on individuals in some way connected to the theory.

#### EXAM TIP

When writing evaluation points for short answer questions, such as 'explain one strength/weakness of theory X', you should make your strength/weakness a clear **Point, Explain** it fully and **Link** it back to the theory you are evaluating to explain the significance of the point you are making. This is known as the PEL evaluation structure.

Typically these questions will ask you to 'explain' a strength/weakness of a theory, or 'justify' why a theory is valid/credible.

However, when you are writing an essay, such as 'evaluate a theory', you can develop your strengths and weaknesses further by assessing their value/significance.

You can do this by making your **Point, Explain** your point fully, **Link** your point to the theory or study being evaluated (say why the point is relevant), and then **Assess** your point, and then finally **Link** the information back to the question by summing up its significance. Using the **PELAL** approach will develop your essay-writing evaluation skills and make help you make your point clear.

There is a range of command words that can be used to indicate that critical evaluation skills are needed to answer an essay question. Here are a few examples.

Evaluate...

Assess...

To what extent...

## EVALUATING PSYCHOLOGICAL RESEARCH STUDIES

We can use an example of a fictional study on the effect of stress on performance. Two participants were asked to come to a laboratory and complete a jigsaw puzzle to see if age affected performance. One participant was told they only had a limited time to complete the puzzle and the other was not. Their jigsaw puzzle completion time was recorded and they were told to leave without any explanation.





▲ It could be argued that doing a jigsaw puzzle is an ordinary task, but does it reflect the reality of everyday tasks?

- Is making a participant uncomfortable or pressured an ethical thing to do? Not really: it is stressful and the participants were deceived because they thought it was a study about ageing, and were not debriefed following the experiment. There is a range of ethical guidelines for research with humans that can be used to evaluate a research study; clearly this example violated some of the ethical guidelines.
- Can you generalise the findings of the study to others? In this example only two participants were used, and only one in each condition of the experiment. The experiment should have used a larger sample of participants to be sure that the findings could be generalised to others.
- Is the experiment reliable? To be reliable, it would have to be repeated over and over or on a larger sample of people to be sure the results were consistent. It would also need good controls over factors that might affect the results. In this example, variation between participants, for example resilience or spatial ability, could affect the reliability of the findings. This means that the study may not find consistent results. Some research is unique and cannot be repeated exactly, such as a case study. This means that the study cannot be replicated to check for consistent outcomes.
- Has the research been carried out in a natural environment? This research was conducted in a laboratory, so is artificial and does not reflect real behaviour in an everyday situation and therefore lacks ecological validity.
- Is the task ordinary? Perhaps it could be argued that solving a jigsaw puzzle is ordinary, but it depends on the aim of the investigation. In many experiments, participants are required to perform tasks that do not reflect the reality of normal everyday tasks; they lack mundane realism. This means that the study tells us nothing useful about everyday behaviour.
- Do the findings have any practical application? If a study can be used in an everyday context or has been used to develop treatments as part of an intervention programme then it has a real world application.
- Is the task a useful measure of what was intended to be measured? In this case, is time taken to complete a jigsaw a good measure of performance? It is a restricted measure of performance in that it only measures the ability to recognise patterns and show reasonable spatial awareness. Therefore it is probably not a useful indicator of general performance.
- Are there any other research studies that do not support the findings of this one? Contrasting research may be useful to demonstrate that the research may not be credible.

### EXAM TIP

Explaining the significance of your evaluation point is critical to ensure that you gain the maximum available marks for a short answer question, and to access the higher marking levels in an essay. Explaining the significance of a point can be tricky at first, this is because you really need to think about how the evaluation point affects a study or theory.

Consider these examples:

If you are giving a weakness of a theory which argues that the theory fails to account for a behaviour all of the time, then the significance of this point is that the theory is only a partial/limited explanation for the behaviour it explains.

If you are suggesting that a study lacks generalisability because the sample used was limited, then the significance of this point is that the study cannot usefully predict the behaviour of others in a similar situation.

## APPLYING YOUR KNOWLEDGE TO EXPLAIN A NOVEL SCENARIO

The point of studying psychology is so you can use your knowledge to explain a range of everyday behaviours. This involves applying your knowledge to a novel scenario to suggest why a behaviour is being displayed.

### EXAM TIP

Throughout the examination you will be asked to draw upon your knowledge and understanding of psychological theories and concepts to explain an everyday behaviour described in a scenario. These application-style questions can be short answer questions or 'Discuss' essays.

For short answer questions you need to show knowledge and understanding of the theory or concept and be able to use this to explain a behaviour. The acronym IDEA may help frame your answer:

**I**dentify the concept/element of the theory – this could be a key term

**E**xplain the concept/key term by providing a definition

**A**pply this definition to the context

You can use the same writing frame for 'discuss' essays, but will need to do this using multiple concepts/key terms.

## METHODS

You will learn about a range of scientific methods as you progress through your Psychology A level Student Book. You will find that the some methods are repeated in later topics in the specification. This table shows you where you can find information on each method within this book.

Method	Topic A: Social psychology	Topic B: Cognitive psychology	Topic C: Biological psychology	Topic D: Learning theories
Experiment		X		
Self-report: questionnaires and interviews	X			
Observation				X
Correlation			X	
Biological methods: scanning, twin and adoption studies			X	
Case study		X		
Content analysis				X
Ethical guidelines	X			
Animal research and ethics				X
Sample selection and techniques	X			
Hypotheses and variables		X		
Descriptive statistics	X			
Inferential statistics		X Mann-Whitney & Wilcoxon test	X Spearman's rank test	X Chi-squared test
Analysis of correlation data			X	
Scientific status of psychology				X
Analysis of qualitative data	X			



# **TOPIC A**

# **SOCIAL PSYCHOLOGY**

Social psychology looks at how our relationships with others affect our own behaviour. This topic examines how those in authority influence our behaviour and how being in a group can influence the way we act. Some of us will obey authority and go along with the crowd, while others will question and resist authority. This means that some people are influenced by others, but there are individual differences between us which may explain defiance.

This topic examines factors that influence our tendency to obey and conform. We often observe others in social situations and try to guess why they behaved that way. For example, you may witness your friend acting differently with their family than they do with their friendship group. This may be because their family expects good behaviour, but the friendship group has different expectations. Social psychology involves a rigorous and scientific investigation of these attitudes and behaviours, using experiments and surveys to establish firm conclusions.

In this topic, you will also learn about specific research that has been conducted in social psychology. Finally, there will be the opportunity to conduct your own research into a topic relevant to this approach.



# CHAPTER 1 OBEDIENCE

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand and evaluate theories of obedience, including agency theory and social power theory
- describe and evaluate Milgram's research into obedience
- explain factors affecting obedience and dissent, including individual differences, situation and culture.

## GETTING STARTED

Imagine that you are in your school library studying for an important examination. You are working silently alongside other students who have exams too. The head librarian, a respected staff member at your school, approaches your table and asks you and the other students to leave your seats immediately as there is a special guest speaker who needs the library to give a lecture. You would rather continue to work in the library because it is the only quiet space in school and the exam is very important.

In small groups, discuss how you might react when the librarian requests that you leave. What factors would make you leave the library and what factors would make you stay? Compare your discussion to others in the class.

## KEY TERMS

**conformity:** a form of social influence where our opinions, beliefs and/or behaviour are influenced by a majority

**minority influence:** a form of social influence where the opinions, beliefs and/or behaviour of the majority are influenced by a minority (individual or small group)

**obedience:** complying to the orders of an authority figure

**social influence:** how our opinions, beliefs and behaviour are influenced by the real or imagined pressure of an individual or group

## THE ORIGINS OF SOCIAL PSYCHOLOGY

Social psychology developed from a group of people working in Europe in the mid-19th century, who were concerned with understanding the collective or group mind. In 1895 a French writer, Gustave Le Bon, observed that crowds displayed mob-like behaviour because individuals within it changed their behaviour because they were part of a group. The idea that an individual's behaviour can be changed by the presence of others is central to social psychology today.

The rise of experimental social psychology can be attributed to Floyd Allport (1924). His book outlined a manifesto for social psychology that argued for an experimental approach, leading to laboratories' investigation of social behaviour.

Today, social psychology investigates a range of social behaviours and attitudes such as persuasion and attitude formation, **social influence**, aggression and group behaviour. This topic focuses on **obedience**, **conformity** and **minority influence**.

## OBEDIENCE

Obedience is a form of **social influence** where the behaviour of an individual is influenced by a real or imagined pressure from another. Obedience can be defined as compliance to the real or imagined demands of an authority figure. Yielding to these demands is considered to be obedience, while rejecting the demands is known as dissent or resistance to authority.

In our everyday lives we obediently follow the instructions of teachers, employers, police officers and the rules of society. Such obedience can prevent accidents and results in social order most of the time. However, there are times when obedience has led to horrific consequences. Notably, many atrocities that have been committed against innocent people have been the result of unquestioning obedience. During the Second World War, the Nazi party instructed the systematic killing of millions of Jewish people. This could only have been achieved through the collective obedience of many German soldiers who carried out these orders.

## AGENCY THEORY OF OBEDIENCE

Stanley Milgram wanted to investigate conditions that could explain the atrocities committed during the Nazi control of Germany, in particular the defence claims made by many senior Nazi officers





▲ We are socialised to be obedient to authority figures from a young age

### LINK

You may find it useful to read about Milgram's experiments (see pages 7–13) before you read on about agency theory.

### KEY TERMS

**agency:** when we act as an agent for another, e.g. obey orders

**autonomy:** acting on one's own free will/exercising self determination

**confederate:** a researcher/actor who pretends to be a participant of a study

**hierarchical:** a system of social organisation where there are leaders and those who follow

**moral strain:** experiencing anxiety because you are asked to do something that goes against your moral judgement

**socialisation:** the process by which we learn the rules and norms of society through socialising agents, such as parents and teachers

that they were simply 'obeying orders'. He developed a series of experiments (that are now classics in psychology) to investigate obedience under these conditions.

Milgram conducted his obedience research using volunteers to investigate whether they would yield to an authority figure and administer electric shocks to an innocent **confederate** of the study. The result of his research led Milgram to conclude that we are all potentially capable of complying with the demands of someone in authority, even if this means hurting another person. Using this conclusion as a basis for his agency theory, Milgram believed that we are all capable of extreme obedience, which must serve some societal function.

### Socialisation of obedience

Milgram observed that human society was **hierarchical** in nature, with many at the bottom of the hierarchy and a few at the top giving instructions on how everyone is to behave. He thought that this hierarchical social organisation must have some stabilising function – to create social order and harmony within the group. Obedience within this social organisation is necessary to maintain social organisation and ensure society's survival. Without obedience there would be challenges to the social order, resulting in chaos and societal breakdown. Therefore it is in our own best interests to be obedient to maintain social order.

Exposure to authority figures within the family and education system nurture obedience through the process of **socialisation**. Parents and teachers are primary socialisers and use a system of rewards and punishments to encourage obedience and discourage dissent in young children. Sanctions and rewards are also institutional within the educational and legal systems, and so perform an important role in ensuring that as individuals we learn to be obedient.

### Agency and autonomy

Within the hierarchical structure of a social group, there must be a mechanism that ensures obedience. Milgram proposed that humans exist in two different psychological states:

**autonomy** and **agency**. In an autonomous state, a human is self-determining, acting according to their own free will, and guided by moral conscience. However, when given instruction by an authority figure, humans shift into an agentic state, where they see themselves as acting as an agent for the authority figure. In the agentic state, we act on behalf of the authority figure and may comply with their demands, which is what we have been socialised to do.

For the most part obedience is functional and does not cause harm. However, when we are ordered to behave in a way that goes against our moral conscience (for example, when we are instructed to do something that will cause harm to another), we shift into the agentic state. We may also displace the responsibility for our actions onto the authority figure making those demands. Milgram believed that the agentic state could explain why humans are capable of committing atrocious acts.

### Moral strain

Milgram observed that many participants in his obedience study experienced **moral strain** when ordered to harm another person. Moral strain occurs in the agentic state when people are asked to do something they would not choose to do themselves, and they feel is immoral or unjust. This moral strain results in an individual feeling very uncomfortable in the situation and, in extreme circumstances, they show anxiety and distress. In Milgram's research he witnessed the participants exhibit signs of moral strain in the form of nervous laughter, sweating and trembling.



**EXAM TIP**

'Discuss' essay questions require you to demonstrate knowledge and understanding independent of application of knowledge. You should explain what a theory says before you apply your understanding of the theory to the context or scenario you have been given.

**LINK**

Burger (2009) also found evidence for agency theory – this study is discussed on pages 62–65.

**KEY TERMS**

**individual differences:** natural variation in human characteristics that may exist between groups when using an independent groups design

**malevolent authority figure:** someone who uses their authority for harmful purposes

**reductionist:** theory that explains a complex behaviour by isolated factors or a single cause, which ignores other important factors. The theory can be argued to be simplistic

**LINK**

See page 16 for a detailed explanation of personality and obedience/disobedience.

**LINK**

Latané (1981) is explored in detail later (see pages 24–25).

**WIDER ISSUES AND DEBATES****Nature–nurture**

Milgram was attempting to establish that obedience was a consequence of the situation in which a person finds themselves (environment). Milgram describes obedience as an ingrained behaviour established through the process of socialisation. Obedience is triggered and amplified by social situations. This suggests that obedience is largely a product of nurture.

**Evaluation of Milgram's agency theory**

Milgram's first obedience experiment demonstrated that 65 per cent of participants were willing to obey an authority figure and potentially seriously harm an innocent confederate of the study. This provides evidence for agency theory because the participants showed overt signs of moral strain (anxiety) when given an order, yet they still obeyed the authority figure, suggesting they were acting as agents. When he debriefed the participants, many reported that their behaviour was the responsibility of the experimenter, and that they had not wanted to do it. This provides evidence for the concept of displacement of responsibility and agency.

During the Vietnam War, a small village called My Lai was approached by American soldiers who were ordered to shoot the occupants, who were suspected of being Vietcong soldiers. Lieutenant Calley instructed his division to enter the village and shoot, despite no return of fire. The American soldiers massacred men, women and children in the village that day after being ordered by Calley. In his court martial following the incident, Calley claimed to be just following orders. Agency theory can be used to explain the reasons given by people for their actions afterwards as being because they were 'just following orders'.

This justification has been cited in many real-life cases of atrocities and offers some support for agency theory involving a displacement of responsibility. It also suggests a practical application of agency theory. We can train people to recognise **malevolent authority figures** and guard against destructive obedience, for example, implementing a 'whistleblower' policy so that individuals can anonymously report anyone trying to get others to comply with harmful orders.

Charles Hofling et al. (1966) staged a study in a hospital setting. A confederate doctor telephoned a nurse working on a ward late at night, asking her to administer twice the daily dose of a drug to a patient. The drug was fake and harmless. Against hospital policy, the stooge doctor informed the nurse that she would sign the prescription later. A total of 21 out of 22 nurses followed the doctor's orders and attempted to give the medication to the patient. Several of the nurses justified their behaviour as being a result of the hierarchy of authority at the hospital. This supports agency theory because the majority of nurses displaced their personal responsibility onto the doctor, even though they did not know the doctor and could not verify their identity.

A weakness of agency theory is that it does not explain **individual differences** as to why some people obey and some do not. Obedience and disobedience/dissent can occur for reasons of personality type, gender and cultural factors.

Obedience also depends upon the circumstances or context in which the authority figure commands compliance. Latané (1981) suggests that the proximity, strength and number of authority figures relative to the target are important situational factors which can determine the impact of influence. This means that obedience is a more complex process than is being explained by agency theory, which can be argued to be a **reductionist** explanation for obedience because it does not consider these situational factors.

Another individual difference which may affect obedience is past personal experience. If someone has been the target of malevolent authority, they may be less inclined to be obedient again. For example, one of Milgram's participants, Gretchen Brandt, resisted the orders of the experimenter. Brandt had emigrated to America from Germany five years before and had grown up during Hitler's time in office. Her resistance to authority may be in part explained by her past experiences.



A different explanation for obedience is provided by social power theory (discussed next).

### SOCIAL POWER OF OBEDIENCE

John French and Bertram Raven (1959) identified five bases of power, which are said to motivate and influence behaviour: coercive power, reward power, legitimate power, expert power and referent power. These factors may provide a different explanation of obedience, and certainly provide an alternative explanation for Milgram's findings from his research study. French and Raven explain that someone can exert influence or control because of the source of power they possess.

#### Bases of social power

French and Raven describe five bases of social power that an individual could use on a target to influence obedience:

- Coercive power: the ability to impose a punishment, e.g. a teacher can issue a detention.
- Reward power: the ability to give a reward or incentive, e.g. a parent can give pocket money.
- Legitimate power: an official/recognised position, e.g. a police officer or elected official.
- Expert power: superior knowledge or expertise held by a credible influence, e.g. a college professor.
- Referent power: respect or admiration, e.g. a celebrity or charismatic leader.

If an individual has a base of social power or is perceived to have that power, they have potential influence on other people, which may explain obedience. However, these bases of power are also contingent upon context. For example, a football referee maintains legitimate power on the field during a game, but not off the field once the game is over. Similarly, reward power is only effective if the target desires the reward on offer.

Wangari Maathai founded the Green Belt Movement and was awarded the Nobel Peace Prize in 2004 for her efforts in environment conservation and sustainability. She may be perceived as having referent power.





### Evaluation of social power theory

One strength of social power theory is that it can be applied to society to explain how organisations (such as corporations or the military) can use hierarchies to create structures of obedience. Senior officers in the military hold legitimate power over lower ranking soldiers. They also hold reward and coercive power, as they can incentivise or sanction the behaviour of soldiers under their command. This may explain why malevolent authority has been implicated in many war crimes. Social power theory can also be used to train soldiers to resist malevolent authority, or promote whistleblowing policies to enable anonymous reporting of destructive obedience.

A further strength of social power theory can be found in Milgram's research. Milgram found that ordinary participants would be willing to administer electric shocks to innocent victims because of the perceived power held by the experimenter ordering them to do so. This could be used as an example of legitimate power, as the experiment was conducted at Yale University, a highly regarded university. The participants may have perceived this environment as one of legitimate power and therefore followed the orders of the experimenter. The participants may have also perceived the experimenter, Mr Williams, dressed in a lab coat, as having expert power as a researcher at the university. This may explain why the participants continued to deliver the electric shocks: they perceived that Mr Williams was in control of the situation and knew what effect the shocks would have on the victims.

A weakness of social power theory is that it fails to take account of the circumstances or context in which the authority figure gives orders. Latané suggests that the proximity, strength and number of authority figures relative to the target are important situational factors which can determine the impact of influence.

A further weakness of social power theory is that it fails to explain individual differences in obedience and dissent. Obedience and disobedience/dissent can occur for reasons of personality type, gender and cultural factors. Focusing on the perceived power held by the authority figure fails to consider the individual differences of the target, so social power theory can be argued to be a reductionist explanation of obedience.

#### LINK

For a detailed description of how obedience and dissent can be explained by personality type, gender and cultural factors, see pages 16–19.

### WIDER ISSUES AND DEBATES

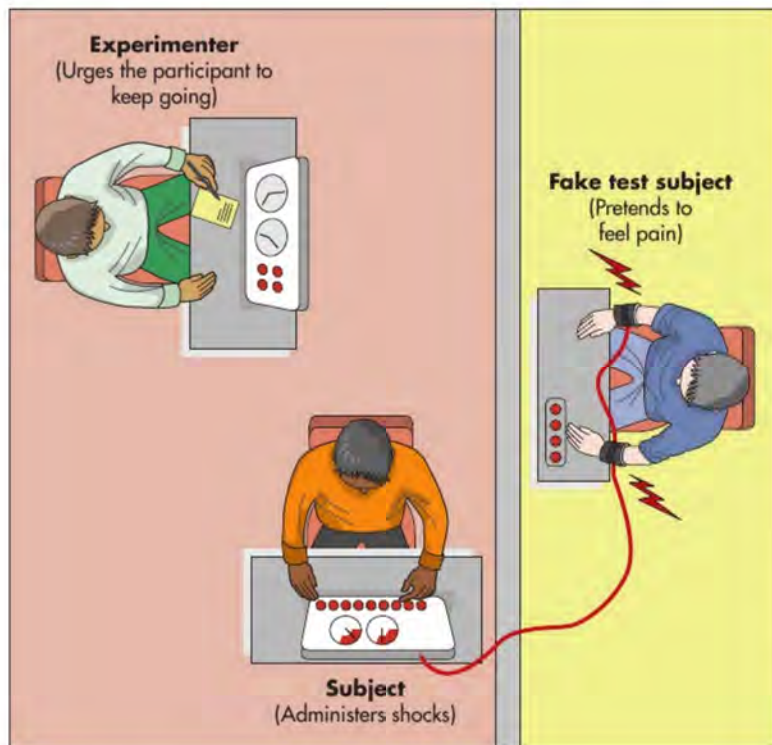
#### Social control

Social control is an important issue in psychology. It considers how psychological knowledge may be used to manage or control others' behaviour. Social power theory gives us knowledge that can be used to manage individuals in certain contexts, such as in a workplace, which can be useful or unjust. This poses ethical considerations as it raises questions about the use of power in society and organisations, particularly if using coercive measures to command obedience, such as in an oppressive regime. However, if social power is used responsibly, it can maintain order and safety.



▲ If social power is used responsibly, it can maintain order and safety





▲ Figure 1.1 Milgram's baseline condition

## MILGRAM'S RESEARCH INTO OBEDIENCE

### AIM

Stanley Milgram wanted to investigate whether ordinary people would follow orders and give an innocent person a potentially harmful electric shock. He was motivated to understand why German soldiers followed commands to torture and kill millions of innocent citizens during the Second World War. He was attempting to investigate why ordinary people could commit acts of atrocity in real life, and so he wanted to make his experiment as close to real 'obedience to commit harm' as possible. He also wanted to establish under what conditions people would display more obedience or dissent, so he varied his original experiment to test different factors.

### SAMPLE

Milgram placed an advert in the local newspaper and used letterbox mail asking for male participants to volunteer in a study of memory and learning. The advert asked for volunteers aged between 20 and 50 from all occupations (excluding students) to apply and offered a \$4.50 payment for their participation in a study of memory and learning

at Yale University. Forty New Haven residents, from a range of professional, skilled and unskilled occupations, responded to the advert.

### PROCEDURE

The study was conducted at the interaction laboratory at Yale University. A biology teacher acted as the experimenter in the study and was dressed in a grey lab coat, and a middle-aged accountant acted as another participant of the study, but in reality he was a confederate.

**Volunteer** participants were invited to the laboratory and introduced to the confederate. The experimenter briefed both of them about how some people may learn more effectively through punishment, and that the experiment was intended to test how much punishment was effective for learning and whether this varied depending on the person's age. This brief was a cover story to justify the procedure of the study to come, and in particular, the use of an electric shock. It also set the scene for the study to assign the two roles needed for the study: a teacher and a learner. The experimenter stated that the fairest way of allocating these roles was to draw lots. The volunteer participant did not know that the draw was rigged, and both lots had the word 'teacher' written on them. This ensured that the volunteer participant was the 'teacher', and the confederate was always the 'learner'.

The teacher and the learner were then taken to another room, and the learner was seated in an electric chair apparatus with his arms strapped down (see Figure 1.1). It was explained to the teacher that this was necessary to avoid excessive movement or escape during the shock procedure. An electrode to administer an electric shock from the shock generator was strapped to the learner's wrist and conductive gel used to avoid blisters from the electric current. The teacher and learner were informed at this point that the shocks would be painful but not dangerous. All of this was a ruse to convince the teacher that the learner would be receiving shocks, when in fact no shocks would ever be administered.

### APPARATUS

The wrist electrode was attached to a fake shock generator in an adjacent room. The generator was a box with a panel of 30 switches positioned in a horizontal line at the front, increasing in 15-volt

### KEY TERM

**volunteer:** participant who responds to an advert; this is called a self-selecting sampling method



increments. Each switch was labelled from 15 to 450 volts, and additional labelling above the switches indicated 'Slight Shock', 'Moderate Shock', 'Strong Shock', 'Very Strong Shock', 'Intense Shock', 'Extreme Intensity Shock', 'Danger' and the final two switches were labelled 'XXX'. A light appeared above the switch after it was pressed and a buzzer could be heard. There was also a blue light and a voltage meter dial, which had a hand that oscillated when a lever was pressed. To convince the teacher that the shocks were real, they were given a 45-volt sample shock which was real.

### LEARNING TASK

The teacher was informed that they should read out a list of word pairs to the learner. After that they should read out one word from the first pair and provide four possible options. The teacher was to administer a shock from the shock generator if the incorrect pair was given as an answer by the learner, starting at 15 volts. After each incorrect response, the teacher was to increase the shock voltage by pressing the next switch on the shock generator. The learner was to respond to the word pair associate list using a set of four switches that the teacher could see on the top of the shock generator. In fact, the sequence of responses from the learner was also rigged so that around one in four responses was incorrect. If the teacher reached 300 volts the learner pounded on the wall, which could be clearly heard by the teacher. The pounding was repeated at 315 volts and from that point on the learner was silent and did not give a response to the word pair task. Typically at this stage the teacher objected to delivering shocks and sought guidance from the experimenter. The experimenter followed a script by giving verbal prods to encourage the teacher to continue delivering shocks even if no response is given by the learner.

Milgram recorded the level of shock reached by the teacher and video recordings were made to analyse the behaviour displayed by the teacher throughout the study. On completion of the study each participant (teacher) was interviewed and reconciled with the learner to ensure their wellbeing.

### RESULTS

All participants gave 300-volt shocks. Only five participants refused to continue beyond this point, and 26 out of 40 participants (65 per cent) went to 450 volts. During these experiments, participants were observed to protest, twitch nervously and show signs of anxiety. Fourteen participants showed signs of nervous laughing, and three participants were observed to have uncontrollable seizures. Despite their distress, they continued to obey. During the **debrief** participants were interviewed about how painful they felt the shocks were for the learner on a scale of 1–14 (14 indicating 'extremely painful'), to which the mean response was 13.42, indicating that they thought the shocks were real.

### CONCLUSION

Milgram concluded that ordinary people would ignore their own moral conscience and deliver harmful shocks to an innocent victim at the command of an authority figure, despite displaying considerable distress while doing so. Milgram concluded that there were several features of the study which may explain this obedience, including the reputation of the university, the legitimacy of the task, the teacher's and learner's voluntary participation, the random assignment of teacher and learner roles, among other factors.

#### KEY TERM

**debrief:** a statement given to participants on conclusion of a study which discloses fully the nature and implications of the research

#### LINK

It may be useful to read Topic B, Chapter 11, and the ethical issues discussed in this section (see pages 10–11) to familiarise yourself with key terms and concepts that will be referred to in this evaluation.



▲ Milgram's experiments initially took place at Yale University which has a well established reputation for academic research



## EVALUATION OF MILGRAM'S OBEDIENCE STUDIES

Milgram's study has been discussed on both methodological and ethical grounds.

### Methodological issues

A strength of Milgram's experiments was that they were highly standardised and controlled. Each participant was briefed in the same way and experienced the same verbal prods, feedback and apparatus. Behavioural data was gathered about how long participants took to press each switch and for how long the switch was depressed. Both objective **quantitative data** and **qualitative** observations were made, making this research highly credible in terms of being both reliable and valid. It also means that retests can be conducted to check whether the same levels of obedience would be observed reliably. However, a reanalysis of Milgram's archive materials on the study by Gina Perry (2013) revealed that the experimenter sometimes deviated from the script by providing additional verbal prods and reassurances to the teacher to coerce them to obey. This raises questions about the degree of standardisation employed. Despite this we cannot claim that the reliability of the findings is in question, and in a replication by Burger (2009) similar levels of obedience to Milgram's research were found.

One criticism of Milgram's original study was that the sample of 40 men is not representative of the general population. One issue is that the participants were recruited by an advert or mailshot, resulting in a volunteer (self-selecting) sample. This could suggest that the participants were more compliant or more authoritarian in character. When debriefed, Milgram noted that participants took part for a range of reasons, and there was not one single overriding factor that could account for high levels of obedience. Milgram also noted that the participants who gave the greatest level of shock tended to blame the learner for their pain rather than themselves or the experimenter, a typical trait of an authoritarian character. However, other research into volunteering characters has tended to find them less rather than more authoritarian.

Another criticism of Milgram's experiments was a suggestion that the participants did not really believe that they were administering harmful or serious electric shocks at all, and were just playing along with the game. Milgram dismissed this claim and made two arguments against it. Firstly, that the observed anxiety of the teachers throughout the duration of administering shocks was evidence itself that they believed that the shocks were real, and secondly that only 2 of the 40 participants in a follow-up experiment thought that the study was a hoax. Milgram believed that these participants were probably defending their own behaviour so that they were not seen as cruel. However, if the participants did believe the shocks were not real, it would threaten the internal validity of the study and question whether an authority figure could command such destructive obedience.

Laboratory research, such as this, is often criticised for being unrealistic and not representative of real behaviour. We can argue that the task lacked **mundane realism**, as we would not ordinarily be ordered to electrocute an innocent victim. This means that the levels of obedience found are unlikely to reflect obedience in a more naturalistic situation. Milgram maintained that the process of obedience was the same regardless of location or task. Interestingly, the Hofling et al. (1966) field study of the doctor–nurse relationship found far more nurses that were willing to obey the instructions of a doctor than Milgram found in his experiment. Perhaps in real life obedience is greater than Milgram's experiments would predict. Or perhaps the Hofling et al. findings could be explained by the strict hospital hierarchy and the legitimate status of doctors at the time.

More recently, a virtual reality experiment has been developed by several researchers to test obedience in computer simulation conditions. Slater et al. (2006) used virtual characters as victims and participants were aware, therefore, that the shocks being administered were not real. Consistent with Milgram's proximity experiment (where the teacher could see the learner), they found that participants who could see the animated victim were less obedient than those who only communicated with the victim via text. This raises the question of whether obedience can be studied under simulated conditions to good effect without the ethical implications associated with using live confederates.

### KEY TERMS

**qualitative:** descriptive data or observations

**quantitative data:** numerical data

### KEY TERM

**mundane realism:** the extent to which apparatus and procedures used in a study reflect real life



## SKILLS

CRITICAL THINKING, ANALYSIS,  
INTELLECTUAL INTEREST AND  
CURIOSITY

## ACTIVITY 1

Gina Perry (2013) conducted an archival analysis of Milgram's reports, video and audio tapes and revealed some major issues with Milgram's findings and conclusions. She found that Milgram overstated the obedience rate of his research, equating to 65 per cent, which did not represent the high levels of people who dissented throughout his variation studies. She claims that many more participants revealed that they knew the study was a hoax and that no real shocks were being administered. She claimed that Milgram's procedures were not as standardised as he claimed. Analysis of video and audio recording showed that there was a great deal of improvisation by the experimenter. Perry believed this to be direct coercion to force the teacher to continue with the shocks.

Gina Perry published a book on her findings, *Behind the Shock Machine: The Untold Story of the Notorious Milgram Psychology Experiments* (2012). You can find extracts of her book and various interviews on the internet. Here is a summary of her main criticisms. Using the internet find out why she made these criticisms and copy and complete the table.

A summary of Perry's criticisms	Why did Perry make this criticism?
Perry looked across all of Milgram's variations and criticised Milgram for making the claim that 65 per cent of participants were obedient.	
Perry criticised Milgram for assuming that the participants believed that they were administering real shocks.	
Perry criticised Milgram for claiming that he used standardised procedures.	

## Ethical issues

Diana Baumrind (1964) heavily criticised Milgram's experiments on ethical grounds. She expressed considerable concern for the welfare of the participants and argued that the stress caused was deliberate. Milgram responded by stating that the anxiety induced by the experimental conditions was not deliberate or anticipated. He had discussed the experimental procedures at length with colleagues and none had anticipated the participants' responses.

Although it is true that the outcomes of research cannot ever be predicted with reliability, it does not explain the fact that Milgram conducted 18 variations to his study, which involved 636 participants. Although the participants' reactions could not have been foreseen at the beginning, they certainly could have been predicted once the experiments were underway. Milgram justified the anxiety he caused to participants by describing it as 'momentary excitement', which in his view was not the same as harm.

Every experiment that Milgram conducted could also be criticised for involving a considerable amount of **deception**:

- participants thought it was a study of memory and learning, not obedience
- they were hoaxed into believing the drawing of lots was real when in fact it was rigged
- they believed that the confederate learner was a genuine participant
- they thought the shocks administered were real.

This deception was necessary for the procedure of the study, but such an approach would be problematic by today's ethical standards. Moreover, it could have caused additional stress and embarrassment for the participants when they were debriefed.

## KEY TERM

**deception:** participants should not be lied to or misguided about the nature of the study



Milgram, however, went to considerable lengths to ensure that participants did not feel embarrassment. He fully debriefed the obedient participants by explaining that their actions were normal, and the dissenting participants were assured that their decision making was justified. He also ensured a friendly reconciliation between the participant and the learner and followed up with a full written report for all participants. He also conducted a follow-up questionnaire for them to express their feelings about the experiment after some time. Milgram's post-experimental questionnaire seemed to confirm that participants did not have any negative feeling about their participation, with 84 per cent having said that they were glad to have taken part.

Although Milgram clearly offered participants the right to withdraw from the experiment, some argued that their right to leave was violated by the verbal prods used by the experimenter. Milgram briefed participants advising them that they could leave at any time without adverse consequence, and they could even take the money incentive. It is true that Milgram did not physically stop the participants leaving. He did, however, enter them into a contract of trust and incentivised their participation with money, and the verbal prods used directly challenged any participant's attempt to leave the situation. In defence of Milgram, the verbal prods were an essential requirement to ensure orders were given that demonstrate obedience. Because 35 per cent (or more) of his participants did end the experiment, it could be argued that the prods merely dissuaded withdrawal.

Milgram vehemently defended his series of experiments, arguing that no one would have been so concerned with the ethical issues associated with the research if they had not found such high levels of obedience from ordinary people.

#### EXAM TIP

If you are asked to 'evaluate' a theory, research study or concept in psychology, you will need to review the strengths and weaknesses of the information, make judgements and form an overall conclusion. For example, if you are asked to evaluate the ethical issues associated with Milgram's research, you will need to consider the weaknesses and strengths of the study in terms of ethics, and consider how the ethical issues could have been justified by the methodology or aims of the study.

You will also need to come to a balanced and considered conclusion. It is useful to 'flag up' this conclusion at the end of your answer by stating 'In conclusion ...' This makes it clear to an examiner that you are fulfilling the requirements of the question. You will need to review the main judgements made in your answer and come to a conclusion based on the material you have presented.

### MILGRAM'S VARIATION STUDIES

Milgram repeated his experiment to investigate under what conditions obedience or dissent would be found to explain why he found such a high level of obedience to authority. The location of his further experiments varied from the original, most being conducted in the basement of Yale University. He also changed the learner feedback to include more verbal protests from 75 volts which progressively intensified ('Let me out of here') and the inclusion of comments concerning the learner's heart condition ('My heart is bothering me now'). This new procedure formed a baseline condition for his variation studies.

#### TELEPHONIC INSTRUCTIONS (EXPERIMENT 7)

To establish whether the proximity of the experimenter had an influence on the level of obedience or dissent displayed by the teacher, Milgram devised a variation where after giving initial instructions to the teacher face to face, the experimenter left the room and continued to give instructions over the telephone.



Milgram found that the number of participants willing to give the maximum 450-volt shock fell from 65 per cent to 22.5 per cent, showing considerable dissent. He also observed that participants continued to administer lower shocks rather than increase the voltage, and even lied to the experimenter about it, with many assuring that they were increasing the shock level. This variation demonstrates that proximity is a situational factor which determines obedience. Greater dissent is found when the authority figure is further away.

The conclusion drawn from this variation can be supported by another condition that Milgram adapted in this variation. This condition involved the experimenter initially giving orders over the telephone, but then returning to give orders face to face. The reappearance of the experimenter caused obedience to rise, suggesting that proximity did have an effect on obedience. This finding is further supported by Sedikides and Jackson (1990) who found that instructions by a zookeeper given to visitors to 'not lean on a rail' was effective while they were in the same bird house room, but not once the visitors had left the room.

Compared to the original study, this telephone variation potentially caused less distress to the participants because the experimenter was not in the same room when he pressured the participants to continue shocking the learner. This can be seen by the sharp drop in obedience and in some participants' defiance in administering an incorrect shock level.

### THINKING LIKE A PSYCHOLOGIST

Digital technology has enabled many people to work effectively from home, rather than travel to a workplace. Often meetings are held remotely, and communication between employers and employees can be done using email or messages. Using your knowledge of Milgram's research, consider how working from home may influence the authority managers have over their workers. You should consider Milgram's variation study to determine how much influence managers would have over their employees when they do not share an office.



▲ How might working from home influence a manager's authority over their workers?



### RUNDOWN OFFICE BLOCK (EXPERIMENT 10)

Milgram was aware that the institutional context of Yale University could be encouraging participants to show a higher level of obedience than they would in less prestigious settings. When follow-up interviews were conducted after the original series of experiments, many participants referred to the integrity of Yale University having given them the confidence to take part in the study. They would not have done if the experiments had been conducted somewhere less prestigious.

He relocated his experiment to a rundown commercial office building in a town called Bridgeport, Connecticut. Participants were recruited through mailshot recruitment and paid for their time. To remove the connection to Yale University, participants were told that the study was being conducted by Research Associates of Bridgeport, a private company conducting research for commercial industry. The same laboratory procedures were followed as in the basement of Yale University, however, the three-room office suite used was rather sparsely furnished but clean.

Milgram found obedience fell to 47.5 per cent, concluding that the less reputable context reduced the legitimacy of the authority and increased dissent among participants. He also reported that participants questioned the credentials of the company on arrival (although these claims were made during debrief).

It could be argued that the venue change for this variation meant that participants were being tested in a more realistic environment than that of the interaction laboratory in Yale University, so it may better represent obedience in a more natural environment. However the task itself was no more realistic. It could also be argued that the change in venue may have resulted in greater distress experienced by the teacher given that the private company did not hold any specific credentials compared to researchers at Yale, which may have been unsettling for participants.

### ORDINARY MAN GIVES ORDERS (EXPERIMENT 13)

In Experiment 13, the role of the experimenter was played by an ordinary man, rather than an experimenter wearing a grey lab coat as portrayed in previous variations. This variation was designed to test the role of authority and status on obedience.

Three people arrived at the laboratory; two of them confederates of the study. A rigged draw was run to determine who would be the teacher, learner and co-participant. The first confederate was given the role of learner. The second confederate was assigned the role of co-participant, seated at a desk and given the task of noting times from a clock; this was the role of the 'ordinary man'. The **naïve participant** was given the role of the teacher, who had to read out word pairs and deliver the shocks. The experimenter followed the usual instructions to strap the learner into the electric shock chair, but did not tell the teacher what levels of shock to give during the study. The experimenter received a phone call to leave the room and departed with a comment to the teacher to continue getting the learner to persist with the word pairs until he had learned them perfectly.

To ensure that some instruction to increase the shock levels was given, the co-participant/ordinary man said that a good way to conduct the study would be to increase the shock level each time the learner made a mistake in learning the words. Throughout the experiment, the co-participant/ordinary man restated this instruction.

Milgram found that 80 per cent (16 out of 20) of participants broke off before the maximum level of shock, resulting in a 20 per cent obedience level. This variation clearly shows that the authority figure has a significant role to play in producing obedience, as without an authority figure there is considerable dissent.

However, Milgram himself acknowledged that there were still traces of authority left behind after the experimenter left the room. This was because the physical removal of the experimenter did not strip the situation of all authority, as the experimenter had already given instructions to administer the shocks.

#### KEY TERM

**naïve participant:** a genuine participant, who is not a confederate of the study

## SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

## ACTIVITY 2

It is useful to understand how the variation experiments compare in terms of similarities and differences. Copy and complete the table to show how the variation experiments are similar or different to the original experiment.

	Milgram's original baseline experiment	Telephonic instructions (Experiment 7)	Rundown office block (Experiment 10)	Ordinary man gives orders (Experiment 13)
<b>Aim</b>	To investigate whether ordinary people would follow orders and give an innocent person a potentially harmful electric shock.			
<b>Sample</b>	Forty male volunteers from the New Haven area.			
<b>Procedure</b>	Conducted at the interaction laboratory at Yale University.  Rigged lots drawn to be teacher or learner.  Learner strapped to shock generator.  Word association memory task.  Verbal prod given.			
<b>Results</b>	100% of participants went to 300 volts.  65% of participants went to 450 volts.			
<b>Conclusions</b>	An ordinary person would harm another if instructed by an authority figure.			

## EXAM TIP

When evaluating Milgram's variation studies, you can use similar strengths and weaknesses to his original study. However, they should be adjusted to match the variation. For example, the procedure of the 'ordinary man' variation was standardised as the co-participant was always given the role of recording timings from a clock seated at a desk, and the experimenter was always called away by telephone call. This means that the effect of lessened authority on obedience level can be re-tested to check for reliability.

These variation studies demonstrate that situational factors, such as proximity and legitimacy of the authority, can determine whether someone is obedient or willing to dissent.



**SKILLS**

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION, EMPATHY

**ACTIVITY 3**

'Discuss' essay questions require you to demonstrate knowledge and understanding independent of application of knowledge. You should explain what a theory says before you apply your understanding of the theory to the context or scenario you have been given.

Read the following question:

Khalid is working in a café as a trainee chef. At work, Khalid works hard to cook good food and clean his food preparation area at the end of his shift. When he is asked to revise the menu in the back room of the café while his manager is away from work, he creates a new menu, even though

he does not want to. Khalid's manager asks him to create the new recipes at home. Khalid does not spend any time at home creating the new recipes. Khalid's manager contacts his parents because he fails to create the new recipes, but his parents cannot get Khalid to work at home.

Discuss, using Milgram's research into obedience, why Khalid only completes his work on some occasions and not others. You must make reference to the context in your answer. (8 marks)

For this question you need to show knowledge and understanding of Milgram's research into obedience, and show application of this knowledge to the scenario. It is helpful to make a plan before writing your answer.

Copy and complete the table.

Knowledge and understanding of Milgram's obedience research	Application to scenario
Milgram's (1963) original laboratory study found that 100% of participants obeyed the instructions of the authority figure to administer shocks up to 300 volts, with 65% continuing to 450 volts.	The café setting may have a status associated with legitimising instructions to complete cooking and cleaning tasks when asked to do so, which is why Khalid works hard at the café.
In Experiment 10, rundown office block, Milgram found that the situational variable of having lower prestige in the environment that orders are given reduced obedience levels to 47.5%.	
In Experiment 7, telephonic instructions, Milgram found that the number of participants willing to give the maximum 450-volt shock fell from 65% to 22.5%.	
In Experiment 13, ordinary man gives orders, Milgram found that 16 out of 20 participants did not fully follow instructions in the absence of an authority figure, with only 4 participants reaching 450-volt shock levels.	



**FACTORS AFFECTING OBEDIENCE AND DISSENT/RESISTANCE TO OBEDIENCE**

Milgram's research shows us that obedience and dissent can depend on a number of factors. Other researchers have investigated a variety of factors to understand whether different people are more likely to be obedient. Individual differences refer to aspects such as personality and gender. Other factors include situation and culture.

**INDIVIDUAL DIFFERENCES: PERSONALITY**

The obedience research we have discussed so far suggests that situational factors play a significant role in determining levels of obedience. However, while many of Milgram's participants were obedient, some resisted authority. Perhaps individual differences can explain why some people are more or less likely to be obedient to authority.

Personality refers to a set of relatively stable psychological traits which can influence how we think and act. Some types of personality have been associated with obedience and dissent.

**Authoritarian personality**

A person with an authoritarian personality is typically submissive to authority because they may have been raised in a strict household and punished for non-compliance. Theodor Adorno et al. (1950) devised the F-Scale (**Fascism** Scale), a questionnaire used to detect the authoritarian personality. The authoritarian personality has been associated with higher levels of obedience because individuals with this personality type tend to maintain social rules and order.

Stanley Milgram and Alan Elms (1966) compared the F-Scale scores for 20 obedient and 20 dissenting participants involved in Milgram's experiments. They found that obedient participants had a higher F-Scale score, indicating an authoritarian personality type, compared to the dissenters. However, the F-Scale is a self-reported measure, and the link between authoritarianism and obedience is a correlation, so we cannot be sure that it causes obedience.

Michaël Dambrun and Elise Vatiné (2010) conducted a simulation of Milgram's experiment using a virtual environment/computer simulation and found that authoritarianism was linked to obedience. Those with high authoritarian scores were less likely to withdraw from the study, perhaps because they were submissive to the authority of the experimenter, or showed a desire to punish the failing learner.

**LOCUS OF CONTROL**

Milgram conducted a series of follow-up investigations on participants who were involved in his obedience research to uncover whether certain individuals would be more likely to obey or dissent. In one study, 118 participants from Experiments 1–4 who were both obedient and disobedient were asked to judge the relative responsibility for giving the shocks. They indicated who was responsible for the shocks being given by moving three hands on a round disc to show the proportionate responsibility for the experimenter, the teacher and the learner. He found that dissenting participants gave proportionately more blame to themselves (48 per cent) and then the experimenter (39 per cent). Obedient participants were more likely to blame the learner (25 per cent) than were the dissenters (12 per cent).

It seems that dissenting individuals take more of the blame, whereas obedient people are more likely to displace blame. This can be explained by Rotter's (1966) locus of control personality theory. This theory outlines two different personality types: those with an internal and those with an external locus of control. People with an internal locus of control tend to believe that they are responsible for their own actions and are less influenced by others. People with an external locus of control believe that their behaviour is largely beyond their control and instead is due to external factors. These people are more influenced by others around them. This seems consistent with Milgram's findings that obedient people have an external locus of control; not only are they more likely to be influenced by an authority figure, but they also believe that

**KEY TERM**

**fascism:** a very nationalist and authoritarian position, intolerant of others' views, based on an extreme right-wing political position



they are not responsible for their actions. Dissenters, on the other hand, are more resistant to authority and more likely to take personal responsibility for their actions.

Albert Blass (1991) investigated the relationship between locus of control and participants' reactions during the Milgram research. Blass found that participants with an external locus of control were more likely to obey the experimenter's instructions to shock the learner and were also more likely to blame the experimenter. However, he also pointed out that the situation had an important role to play, and that obedience should be considered as an interaction between situation and personality; some individuals with an external locus of control may be more susceptible to obedience in particular situations.

### SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

### ACTIVITY 4

Copy and complete the table to demonstrate your understanding of locus of control as a personality factor affecting obedience.

Locus of control	What is the belief?	Obedient or dissenting?
External		
Internal		

### EXAM TIP

Remember that individual differences refer to personality and gender. They are not the same as situation and culture.

### INDIVIDUAL DIFFERENCES: GENDER

Most of the participants in Milgram's studies were male, although he did conduct one variation (Experiment 8) that involved 40 women. Previous research had indicated that women were more compliant than men, yet traditionally we think of women as more empathetic and less aggressive, which might suggest that they would be less likely to comply with orders to shock an innocent victim. This contradiction would be played out in a variation study that commanded both compliance and empathy. Milgram found that women were virtually identical to men in their level of obedience (65 per cent), with 27.5 per cent breaking off at the 300-volt level. Yet their rated level of anxiety was much higher than men for those who were obedient. This was also found in Burger's (2009) replication of this research (see page 62).

Sheridan and King (1972) adapted Milgram's research to involve a live puppy as a victim that received genuine shocks from college student participants. They found that all 13 women were much more compliant and delivered the maximum levels of shock to the puppy compared to only half of men. However, in a review of ten obedience experiments, Blass (1999) found that obedience levels between men and women were consistent across nine of the studies. The study that did not show a similar male/female obedience level was conducted by Kilham and Mann (1974) in a partial replication of Milgram's experiment in Australia. They found women to be far less obedient (16 per cent) than men (40 per cent). However, research into obedience have used different procedures, and produced inconsistent outcomes. This may indicate that there are few gender differences in obedience, despite traditional beliefs that women would be more compliant to authority.



### SITUATIONAL FACTORS

Social impact theory (Latané, 1981) explains that there are three factors which can determine the impact of an authority figure upon a target: strength, immediacy and number. These are factors associated with the situation which can predict the level of obedience observed. If an authority figure has strength (such as legitimate status or power) they will exert greater authority over a target. If an authority figure is proximal/closer to the target, their influence will be greater than if there is a distance between them. If there are more authority figures relative to targets, the influence will be greater.

Milgram's research demonstrates obedience can be influenced by these situational factors. A baseline obedience level of 65 per cent was found, and other variations found this rose or fell depending on whether the authority figure was close or far away from the target, and whether the authority was perceived to be legitimate. Distance seemed to act as a buffer to obedience, as found in the telephonic instruction condition. Status of the authority figure also had an impact on obedience, and Milgram claimed that obedience could only be established when the authority figure was perceived to be legitimate. This was found to be the case when the experiments were conducted at Yale University, and obedience fell when the experiment was moved to Bridgeport or conducted by an ordinary man.

The effect of situational variables on obedience has also been demonstrated in partial replications of Milgram's research. Wim Meeus and Quinten Raaijmakers (1986) devised a series of studies designed to test whether participants would follow orders to be psychologically cruel towards a victim. Using a similar ruse as Milgram, an experimenter gave orders to a participant to test a victim, thought to be applying for a job, and to make the applicant nervous and disturb the test. The applicant failed the test and did not get offered the job as a result of the participant carrying out the orders. When the experimenter was close to the participant, more than 90 per cent of the participants were cruel to the applicant, but this fell to around 36 per cent when the experimenter gave the orders and left the room. This demonstrates that proximity is an important situational factor determining the level of obedience achieved.

### CULTURAL FACTORS

Many behaviours vary across cultures, including obedience, which is shaped by social and cultural norms because culture affects the way we perceive authority. Culture can be divided broadly into two types: individualistic and collectivistic cultures. Individualistic cultures tend to behave more independently and tolerate dissent, which suggests that they resist conformity or obedience. Collectivistic cultures tend to behave as a collective group based on interdependence and cooperation, meaning that compliance is important for the stability of the group (Smith and Bond, 1998). We could assume from this that collectivistic cultures are more likely to be obedient and be less tolerant of dissent.

Thomas Blass (1999) conducted a full review of obedience research (see Table 1.1), analysing research 35 years after Milgram's first series of experiments. His data can be analysed in terms of cultural differences using research employing similar methodology to Milgram.

Although some might argue that obedience levels are not universal, on closer inspection of the methodologies of the research studies, it seems that the variation in percentage of participants who gave the full shock may be a product of the procedure employed rather than cultural variation. For example, Ancona and Pareyson's (1968) research took place in Italy and the maximum shock level was 330 volts, compared to Milgram's 450 volts. Milgram found 73 per cent obedience in his proximity studies which is more comparable to the 85 per cent found in Italy, suggesting that 330 volts was perceived to be less dangerous. In Italy, only student participants were used, which Milgram actively avoided because of their compliant and competitive nature. A similar comparison can be made of Burley and McGuiness (1977), who used only 20 students and a maximum voltage of 225.



TABLE 1.1: OBEDIENCE RESEARCH

Researcher	Country	Percentage of full obedience
Milgram (1962)	US	65%
Edwards et al. (1969)	South Africa	87.5%
Bock (1972)	US	40%
Kilham and Mann (1974)	Australia	28%
Shanab and Yahya (1977)	Jordan	73%
Miranda et al. (1981)	Spain	50%
Schurz (1985)	Austria	80%
Ancona and Pareyson (1968)	Italy	85%
Burley and McGuiness (1977)	UK	50%

In a recent study, Carl-Benedikt Frey (2020) analysed contact tracing data used during lockdown during the COVID-19 pandemic which showed that collectivistic countries recorded less in-country mobility than individualistic countries. Despite the compared countries having similar stringent lockdown government policies and measures, it seems that individualistic countries were more defiant of the rules, or at least were recorded to be less compliant.

The impact of culture on obedience is complex and unclear and our understanding of the topic is often hindered by a lack of research in certain cultures, or a lack of research that can be compared between countries.

### CHECKPOINT

1. It is important to be able to recognise what factor affecting obedience is being referred to in an exam question. Identify which factor is being described in these scenarios by matching the description with the factor. Record your answers in your notebook.

Scenario	Factor
a) Joshua is always obedient to his parents, but his little sister Jane is always disobedient.	Personality
b) School children in one country are reported to have more school detentions than in a different country.	Gender
c) Temi is a very independent young person. When asked to do something by her employer, she refused as she did not agree with the request. She firmly stuck by her decision to not follow the employer's request.	Situation
d) Noorie completed her schoolwork at school but refused to do any schoolwork at home.	Culture

2. You may be asked to identify which type of social power is being used in a given context. Identify which social power is being described in these contexts.
  - a) A well-liked work colleague tells office staff to tidy his desk.
  - b) A senior surgeon in a hospital asks nursing staff to collect their lunch for them.
  - c) A parent imposes a curfew on their child for not doing household chores.
  - d) A computer specialist with advanced technological knowledge tells colleagues to not access certain computer applications while at work.
  - e) An employer instructs warehouse workers to work faster and says they will increase their pay.



3. Identify which variation of Milgram's study had each of the results shown below.
- a) 22.5% of participants reached 450 volts
  - b) 47.5% of participants reached 450 volts
  - c) 20% of participants reached 450 volts

**SKILLS**

ANALYSIS, COMMUNICATION,  
CRITICAL THINKING, PERSPECTIVE  
TAKING, INTERPRETATION,  
REASONING

**EXAM PRACTICE**

1. Describe one individual difference which may affect obedience. (2 marks)
2. Describe how one situational factor can affect obedience. (2 marks)
3. Kayin works as an office worker for a company. Her manager orders her to stay late at work to rearrange some office furniture. Kayin follows her manager's instructions and stays late to complete the task. Using agency theory, describe why Kayin completes the task. (2 marks)
4. Kayin arrives at work the following day and her manager orders her to dismiss several staff in the office because she is too busy to do it herself. The responsibility for dismissing the staff is the manager's, and not part of Kayin's role in the company. Kayin is friends with many of the office staff so she knows that dismissing them will cause harm and she feels bad for them. Kayin follows the manager's order to dismiss the office staff, blaming her manager for the decision. Discuss how agency theory could explain Kayin's behaviour. You must make reference to the context in your answer. (8 marks)
5. Göksal is visiting a museum and while she is looking at a display of ancient ceramics, she is asked by a museum guard wearing a uniform to leave the room immediately. Göksal leaves the room straight away. Explain one strength of agency theory as an explanation for why Göksal leaves the museum room immediately. (2 marks)
6. Alessandro is employed as a maintenance engineer in a factory to repair and maintain machinery. His manager tells him to join the other factory workers on the production line, even though this is not part of his job. Alessandro is aware that the production line workers receive a bonus payment if they meet production targets. Alessandro puts away his tools and starts packing boxes on the production line as told to do by his manager. Describe, using social power theory, why Alessandro works on the production line. (4 marks)

**EXAM TIP**

In the exam, you may be asked 'To what extent...' type questions. For example: To what extent can individual differences explain variation in levels of obedience?

This style of question requires you to review all of the available information and knowledge that you have concerning individual differences in obedience research and theory, and come to a reasoned conclusion that directly answers the question. Similarly, for an 'evaluate' style of question, it is useful to flag up when you are concluding your review by stating 'In conclusion ...' at the end of your answer.



# CHAPTER 2 CONFORMITY

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand and evaluate types and explanations of conformity
- describe and evaluate Asch's research into conformity.

## GETTING STARTED

Think about how you act alone compared to how you act in groups. Do you behave any differently?

Look at this jar of coloured beans. Make an individual estimate of how many beans you think the jar holds. Write your estimate on a piece of paper. Now discuss the number of beans in the jar with a small group. Come to a group estimate and write this down. Now think about how many beans there are in the jar and make a second individual estimate. Write this second estimate on a piece of paper.

- Has your estimate changed?
- Is your second individual estimate closer to the group estimate or further away?
- Have you been swayed by the majority?



▲ Visual estimation is the process of estimating the value or size of something using sight alone.

## TYPES OF CONFORMITY

Conformity, like obedience, is a form of social influence. Conformity is when individuals change their behaviour or attitudes to align with those of the majority. Examples of conformity include adopting the clothing style of our peer group, queuing up in an orderly manner because others are, or engaging in risky behaviours because we are part of a risk-taking friendship group. Like obedience, conformity is not necessarily bad, and it can help maintain social order in society.

The pressure to conform may be real or imagined, and can result in someone genuinely adopting the behaviours or values of the majority (private acceptance) or simply going along even if we don't agree with them (public acceptance). Therefore there are different types of conformity.

According to Kellman (1958) there are three types of conformity: compliance, internalisation and identification.

### COMPLIANCE

Compliance involves going along with the majority to gain social approval or avoid social rejection, even if we don't agree with the majority opinion or behaviour (public acceptance). An individual may publicly go along with the majority while privately holding different views. This type of conformity is likely to have an influence on behaviour while majority pressure exists, but will not have a lasting effect on behaviour.

### INTERNALISATION

Internalisation occurs when you adopt the behaviours or values of the majority because you genuinely accept those behaviours or values and therefore internalise them as your own (private acceptance). This may be because the majority holds knowledge or information of how

to behave in a given situation, so you look to them for how to behave or what to believe. This type of conformity results in the most permanent behaviour change because there is a genuine change in belief or behaviour.

Muzafer Sherif (1935) used the autokinetic effect, an optical illusion where a spot of light projected onto a screen in a dark room is perceived to move, to test conformity. He found that individual estimates of the distance the spot of light moved converged to match a group estimate. Because there was no real correct answer to the distance the spot of light moved, this type of conformity was probably internalisation.

### IDENTIFICATION

Identification occurs when we change our behaviour while in the company of a majority to fit in. This occurs because we want to define ourselves as a member of a group, so we adopt their beliefs and behaviours. This results in a temporary change in behaviour because of group membership, such as adopting a style of dress when with a friendship group.

## EXPLANATIONS FOR CONFORMITY

Types of conformity refer to how we accept the majority view, which can be explained by the nature of the situation in which we experience conformity.

### INFORMATIONAL SOCIAL INFLUENCE AND NORMATIVE SOCIAL INFLUENCE

Morton Deutsch and Harold Gerrard (1955) proposed that there were two forms of social influence which could explain conformity in social situations: informational social influence and normative social influence.

#### Informational social influence

In a situation where we are unsure of how to act and think, we often look to others to guide our actions. In such a case we conform to the majority because we believe it is the correct way to behave, and therefore accept this. Informational social influence can explain conformity in ambiguous situations, and involves a rational judgement being formed based on the information available to us in the social situation. This can explain a type of conformity known as internalisation because we genuinely believe in the majority view (private acceptance).

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### THINKING LIKE A PSYCHOLOGIST

In today's world, we are hugely concerned with climate change. Efforts are being made to reduce our carbon footprint, reduce food waste and to recycle. Using your knowledge of social influence, consider ways that could be used to help change behaviours to help reverse climate change.

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#### Normative social influence

Sometimes we conform because we have a need to be accepted and fit into a group, or to avoid rejection. Peer pressure is a common form of normative social influence, particularly in adolescence when we want to feel a sense of belonging and avoid isolation from our peers. This can result in the types of conformity known as compliance and identification, because we wish to fit into the group and gain social approval.

Solomon Asch (1956) demonstrated normative social influence in a series of experiments where sometimes participants selected an answer that was obviously incorrect because of social pressure to conform to the group judgement.



**SKILLS****CRITICAL THINKING, ANALYSIS,  
INTERPRETATION****ACTIVITY 1**

When asked to define informational and normative conformity, it is often useful to provide everyday examples. These examples may come from your own personal experience.

An example of informational conformity: in a high-end restaurant, a diner looks at other guests to see which cutlery to use for their starter course because they do not know which fork to use.

An example of normative conformity: in a friendship group, many of the group have started listening to a new musician. Not all members of the friendship group like this music, but they all buy tickets to see the musician play live.

Think of your own examples of informational and normative conformity.

**Evaluation of informational and normative social influence as an explanation for conformity**

Arthur Jenness (1932) asked participants to judge individually how many beans were in a glass bottle, then provide a negotiated group estimate, and then a second individual estimate. He found that individuals tended to shift their second estimation towards the group estimate. This research demonstrated informational social influence in an ambiguous situation because the group offered perhaps more accurate information. Similarly, Muzafer Sherif (1935) found that participants adjusted their estimate of the distance the spot of light moved to the group estimate because they were unsure of their answer.

Asch (1956) found evidence for normative social influence in his series of experiments investigating majority influence. He found that participants sometimes gave an obviously incorrect answer when other members of a group gave the wrong answer, even though the correct answer was clear. This demonstrates normative social influence.

These studies support informational and normative influence as an explanation for conformity. However, they were conducted in controlled laboratory conditions. While they demonstrate the process of majority influence, they tell us little about social influence in real-life situations, such as peer pressure in a school or workplace.

While there is clear experimental support for Deutsch and Gerrard's explanation for conformity, it fails to take account of the underlying motivation for why someone may choose to conform or not. The reasons for why we may choose to conform may be based on more than absence of knowledge or pressure. For example, it could be that we simply choose to conform to driving speed limits for personal safety.

This theory also ignores the role of individual differences in conformity, such as personality factors, gender and cultural values that influence conformity. It also does not fully explore situational factors that are known to affect whether we are more likely to conform or resist majority influence.

**CONFORMITY TO SOCIAL ROLES**

Social situations are governed by social norms. These social norms demand we behave in a certain way in a situation. Individuals adopt or are prescribed social roles in social situations, behaving according to the social norms of that role. For example, being a teacher is a role in society that requires certain norms of behaviour, and a teacher is expected to be an upstanding citizen and role model for the children they teach. A teacher would be expected to conform to the social role they are attributed to.

Conformity to a social role involves a type of conformity called identification. We conform to the norms of the social role while we are in that role, but not when we are out of that role. For example, a teacher will behave according to their social role and internalise those norms when at school, but may not when it's a school holiday. We all play multiple social roles in society and adjust our behaviour to conform to those role expectations accordingly.

**LINK**

Asch (1951) and his variation studies (1952, 1956) are discussed in detail on pages 26–29.

**LINK**

Situational factors relating to conformity are discussed in detail on page 34.



Philip Zimbardo et al. (1973) demonstrated the power of conformity to social roles in a prison study undertaken at Stanford University. He recruited college students to play the role of either a prison guard or prisoner in a simulated prison in the basement of the university. Over a short period of time the 'prisoners' became passive, and the 'prison guards' became aggressive and controlling. They had adopted the social roles they had been given. In a replication of Zimbardo's prison study, Steve Reicher and Alex Haslam's BBC prison study demonstrated that conformity to social roles was not as simple unthinkingly playing a role you are given, but dynamic and influenced by factors such as identification with the group you represent.

### SOCIAL IMPACT THEORY

Social impact theory is an explanation for many forms of social influence, including conformity and obedience. Latané (1981) proposed that we are greatly influenced by the actions of others: we can be persuaded, inhibited, threatened and supported by other people. These effects are the result of others' actions, and they change how we feel and how we act in response. This is known as social impact because of how others, real or imagined, impact on us.

Latané referred to targets and sources of social influence. The target referred to the person being impacted on, and the source referred to the person who was the influencer. He developed a formulation of different social forces that result in more or less social influence being exerted on the target. In the context of conformity, the source of the influence is the majority, and the target is the individual who feels real or imagined pressure from the source.

### Social forces

According to Latané there are three social forces that determine the strength of majority influence.

1. Strength refers to the real or perceived status, legitimacy or authority of the source. In terms of conformity the stronger the majority, the more likely someone is to conform to their influence.
2. Immediacy refers to the proximity or distance between the source and target. If the majority is physically close to the target the majority is more likely to have an influence.
3. Number refers to how many sources and targets are in the social situation. The greater the majority, the more influence is exerted. However, this is only up to a point as a huge majority of one hundred will not necessarily have a greater influence than a majority of fifty. Latané explained this as like turning on a light bulb in a dark room. The first bulb will provide the greatest illumination, which will be added to by a second bulb, however turning on more bulbs will not have a greater effect on illumination in the room.

▼ After a certain point turning on more bulbs will not have a greater effect on the light levels in a room



Latané explained that the impact of these factors was multiplicative and divisional.

This means that the combined effect of the strength, immediacy and number is greater than their individual effects, so conformity is determined by a combination of strength, immediacy and number. If a source has strength, immediacy and number then it will have a greater impact on conformity than if it has strength and number but not immediacy. He expressed this as a formula for impact:  $I = f(SIN)$  where  $I$  is the impact/conformity shown by the target, which is the function of a combination of the source factors (strength, immediacy and number).

This theory can also be used as an alternative explanation for obedience. In terms of obedience, this suggests that authority figures who are perceived to be legitimate, who are immediate to the individual and who are greater in number, will be more likely to command obedience.



Social impact theory can be related to types of conformity.

- Compliance can be explained by normative social influence. If a majority is perceived to have strength, immediacy and number, it may put pressure on an individual to conform publicly even though they privately disagree.
- Identification can be explained by normative social influence. If a majority is perceived to have strength, immediacy and number, an individual may desire to identify with the group, or it may motivate them to identify with the group norms.
- Internalisation can be explained by informational social influence. If a majority is perceived to have strength, immediacy and number, it can serve to motivate an individual to internalise the group's beliefs and view them as credible.

### WIDER ISSUES AND DEBATES

#### Issues of social control

Social impact theory can be regarded as helpful in that it can help us develop forms of useful social interaction. It can be used to decide:

- who to appoint to a position of leadership and management because of the strength of their influence
- how many students should be in a classroom or colleagues in a work environment because the number of sources and targets are important
- how to deal with issues of crowding and indeed any other social situation where humans interact with each other, because the number of people in a crowd can determine any impact others may have on them.

Latané referred to this as social engineering; others might consider it to be a form of social control.

### EXAM TIP

In the exam, you may be asked to describe a theory of obedience or conformity. The term 'describe' is used when you need to give an account of something, in this case a theory. You do not need to justify or explain your response, nor do you need to evaluate the theory or make judgements.

To revise the descriptive elements of a theory, it can be useful to devise some prompts to help remember its key elements.

For social impact theory, you might wish to use the following key word prompts:

- strength: *the strength of the source relative to the targets can influence obedience and conformity. Strength can be determined by legitimate authority or status. For example, a police officer has legitimate status.*
- number:
- immediacy:
- multiplicative and divisional:

Complete the key word prompts for number, immediacy and multiplicative and divisional.

### Evaluation of social impact theory

Berkowitz, Bickman and Milgram (1969) conducted a study at the City University of New York that demonstrated the diminishing effect on conformity of the number of sources. They got between 1 and 15 confederates to congregate on the street and crane their necks to look up at the sixth floor of the university building. Stanley Milgram was in a sixth-floor window video recording the confederates below, and the passers-by who also stopped and craned their necks to look up. The videos were analysed and the number of passers-by who stopped were counted. They found that although increasing the number of confederates craning their neck did increase the number of passers-by imitating their actions, this did not continue to rise with more confederates craning their neck. The effect levelled off.

Solomon Asch (1956) also investigated the size of the majority on participants' conformity to the group. He found that as the number of confederates giving a wrong answer increased, participants were more likely to conform. However, as the size of the majority increased further, conformity did not continue to rise, but instead levelled off. The presence of a majority of three to four achieved conformity, but a greater number did not significantly increase the level of conformity observed. Asch also found that the presence of just one dissenter who gave the correct answer reduced conformity. This study demonstrates the role of number in predicting conformity.

### WIDER ISSUES AND DEBATES

#### Reductionism

Social impact theory views individuals as passive receivers of others' behaviour towards them, disregarding the active nature of social interaction, and indeed what the target themselves brings to the social situation. Everyone is different, so this theory seems to oversimplify the nature of human interaction and ignore individual differences between each of us. Some of us are more independent and therefore more resistant to majority influence.

### ASCH (1951) AND HIS VARIATION STUDIES (1952, 1956)

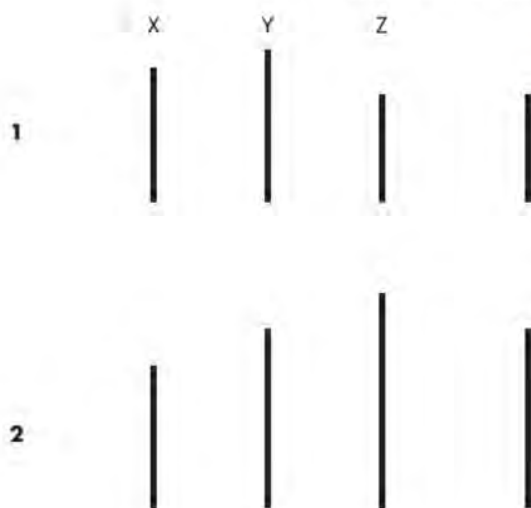
Solomon Asch conducted a range of different experiments to test conformity and investigate the various factors which affect conformity levels. While the procedures vary slightly between the variation studies, typically Asch placed a naïve participant in a group of confederates to see whether the naïve participant would conform to the group norm.

#### ASCH (1951) AND HIS VARIATION STUDIES

Solomon Asch conducted a series of laboratory experiments designed to test majority influence on conformity. Fifty male college students were put into groups of eight and asked to match the length of a standard line with one of three lines of unequal length; one of which matched the standard line and two which differed in length (see Figure 2.1).

Each group member was asked to judge which line matched the standard line publicly. Unknown to one participant, the other seven group members were confederates who responded with a wrong answer, so the participant was confronted with a group that unanimously selected the incorrect line. The frequency of incorrect responses made by the participant were calculated as a measure of conformity to the majority decision. Following the procedure, the participant was immediately interviewed and debriefed as to the true nature of the study.

Over the 12 trials, where the group responded with an incorrect answer, 32 per cent of estimates made were errors in line with the majority incorrect response. Despite the majority pressure, 68 per cent of estimates



▲ Figure 2.1 Participants in Asch's research were asked to judge which line out of three options matched the length of the standard line



were correct. It was also noted that there were individual differences, with some participants conforming in almost every trial and some never conforming. Observations made of the participants throughout the trials suggested that those who maintained their independence, and therefore did not conform, did so because they were either confident, maintained individuality or maintained task focus. Those individuals who conformed were thought to lack confidence in their perception or to want to fit into the group.

Asch concluded that conformity could only be explained by a combination of situation pressure and an individual's response in that situation. To investigate further he designed a set of experiments to test different situations. In one variation, two naïve participants were in the group, and a further variation involved one naïve participant and one confederate who correctly identified the correct line along with six group members identifying an incorrect comparison line. Both variations were designed to test whether a broken majority had an influence on conformity. The frequency of errors made were 10.4 per cent and 5.5 per cent respectively, showing a reduced majority caused a fall in conformity, perhaps because the partner acted as social support against the majority influence.

A further variation demonstrated that losing a partner midway through the trial caused the participant to lose their independence. The loss of support caused them to conform. The reverse effect was found when a partner was initially conforming but then broke off midway and began giving the correct responses, however the effect was reduced as participants found it difficult to change from conforming to then show independent behaviour.

In a final series of experiments Asch investigated the impact of the size of the majority on conformity. Participants were placed into groups with a majority of 1, 2, 3, 4, 8 or 16. In all conditions the majority were unanimous in making an incorrect comparison line judgement. Unsurprisingly, one confederate did not really influence the decision of the naïve participant. When the majority rose to two confederates, participants selected the wrong line 12.8 per cent of times, but the greatest error rate was achieved with a majority of three confederates. Larger majorities did not seem to produce any greater effect than a majority of three.

### Conclusions

Asch concluded that majority influence did produce conformity when the majority was unbroken/unanimous, and at an optimal majority size of three. However, individual differences between participants were also important as a factor to consider in predicting conformity.

### ASCH (1952) AND HIS VARIATION STUDIES

In this series of experiments the basic procedure of Asch's original research was followed. Participants were male college students who were placed in groups of seven to nine and gathered in a classroom. The participants were chosen by the confederate majority as acquaintances. The procedure followed the original, with the majority selecting the correct comparison line for the first two trials. However, during the third trial, where the majority declare a wrong answer, an individual in the group claims that the answer given by them is wrong. From time to time the individual repeats his dissent to the majority response and sometimes agrees with the incorrect response. This presented an additional force on the naïve participant who now had to contend with majority pressure and someone who disagreed with the majority.

#### KEY TERM

**control group:** a group of participants that does not experience the experimental situation but acts as a baseline against which to judge any change

Asch found that one third (33.2 per cent) of responses given by the naïve participants were incorrect and consistent with the error judgement of the majority. With a similar conformity rate to that found in the 1951 series of experiments, it highlights that participants are not simply conforming because they believed that the majority was correct in their judgement (the dissenter questioned that judgement), but that the participants were yielding to social pressure. This was compared to a **control group** of participants who were able to give their responses in private by writing them down, which measured 7.4 per cent of responses were in error. Like



the 1951 research, Asch found significant individual variation between participants: some maintaining independence and some yielding to the majority.

In this series of experiments Asch also conducted several variations, including one where the majority selected a comparison line which was very obviously different to the standard line, which reduced the error rate slightly to 27.2 per cent, but did not drastically diminish the majority influence. In a further variation he reduced the size of the majority to one single person, which completely abolished any effect on decision making, and in fact resulted in the single person being challenged by the naïve participant. In a variation where a single group member consistently gave the correct line judgement in contradiction to the majority, conformity weakened to 13 per cent of estimates being errors, with few participants giving multiple wrong line judgements. Asch claimed that this variation did not abolish the majority influence completely, in fact those participants who chose the incorrect line did so by abandoning the partner for the majority. A final variation involved the majority comprising 16 naïve participants and a single person responding incorrectly. The single member was a minority and had no impact on the estimates of the naïve majority. In fact, the single member was mocked by the naïve majority and suspected of deliberately giving the wrong answer.

### Conclusions

Asch concluded that we are still likely to yield to majority influence when it is questioned and when obviously wrong.

### ASCH (1956) AND HIS VARIATION STUDIES

In this experiment Asch conducted the basic procedure on 123 college students in groups of seven to nine. One naïve participant, seated in the second to last chair in the classroom, was asked to select a comparison line after hearing other group members give correct or incorrect line judgements. In a total of 12 trials where the majority selected an incorrect line, the comparison line selected was either moderately different to the standard line or extremely different to the standard line. This study was designed to test whether the majority could command compliance even if their judgement was obviously incorrect. The responses of naïve participants who were asked to publicly announce their judgement was compared to a control group of naïve participants who privately wrote down their judgement.

The control group of 37 naïve participants gave only three incorrect line judgements, compared to one third of incorrect responses given by the experimental group. Asch found that when the majority selected a moderately different (incorrect) line, naïve participants also made a moderate selection. However, when exposed to an extreme judgement four-fifths modelled the judgement and one-fifth made a compromise by selecting the moderately different line. Like previous experiments, Asch noted a considerable variation between participants, some maintaining absolute independence from the majority and some yielding completely.

To investigate whether conformity to line judgements would extend to other perceived stimuli, Asch asked participants to discriminate between two coloured discs, of which the judgement was whether the comparison disc was brighter or darker than the standard disc. Over 12 trials where the group made incorrect judgements by deliberately saying that the disc was darker or lighter than the standard disc, 39 per cent of the naïve participants responses were incorrect. A further variation which involved the group giving public judgements and the naïve participant giving a private response, conformity was lowered to just 12.5 per cent of incorrect estimates.

### Conclusions

This series of conformity experiments demonstrate the power of the majority over a minority; participants were complying because of normative social influence. Situational factors can influence rates of conformity, such as having social support and the size of the majority. However, individual differences between people also affect how they respond in a social situation.



**SKILLS**

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

**ACTIVITY 2**

There are lots of Asch studies and variations within each. To help with your understanding, compile a table based on the following to highlight the differences between them.

**DIFFERENCES BETWEEN ASCH'S STUDIES**

	Asch (1951)	Asch (1952)	Asch (1956)
Aim(s)			
Sample			
Procedure			
Results			
Variations			
Conclusion(s)			

**EVALUATION OF ASCH'S STUDIES**

One weakness of Asch's research on conformity is that we cannot be sure that the findings extend beyond a laboratory setting, so they may not be useful in explaining conformity in everyday life. While Asch demonstrated that conformity to a trivial line judgement may occur in the laboratory, in real life where decisions to conform or not may hold greater importance, such pressure to conform may not exist or may indeed be stronger. This is a problem with the ecological validity of the study.

Asch's research can also be criticised on ethical grounds as the participants were not fully informed about the nature of the study. They were deceived about the other group members, and were put under considerable stress when asked to make a public judgement which was not consistent with the majority. However, these breaches of the ethical guidelines were a necessary part of the procedure as if participants knew the true nature of the study they would have acted very differently.

A further criticism levelled at Asch's research is that conformity often exists within groups where group members are familiar, such as family and friendship groups, and not among virtual strangers or loose acquaintances. Kazuo Mori and Miho Arai (2010) partially replicated Asch's research using participants who knew the confederates. They found that males (but not females) were less likely to be swayed by the incorrect responses given by the confederates. This research may offer more useful insight into conformity in everyday situations.

Questions have been raised about the stability of conformity over different times and cultures, and with different types of participants. Asch tested American, male, university students during the 1950s. Research using different populations in different decades have not produced the same conformity rates as Asch, suggesting that conformity may not be a stable human characteristic.

A strength of Asch's study was that his procedures were highly standardised and controlled. Participants over the trials were all given the same line judgement tasks in exactly the same way, allowing the researchers to precisely measure conformity using the objective measure of error rate. This means that the influence of the majority on conformity can be retested to check for reliability.

The highly standardised and controlled nature of the study also increases its internal validity, indicating that his results for the number of incorrect line judgements given by participants were only affected by the majority and not any other variable.

During your study of this topic you will have opportunities to apply your knowledge to different contexts. In Paper 4 you will also be asked to use your knowledge of the topics and approaches to discuss a key question of relevance to society. You will be given a key question and some background information to help apply your knowledge of concepts, theories and research to explain the key question. You should also consider other plausible explanations and develop a for and against argument for the key question you have been given.

**SKILLS**

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

**ACTIVITY 3**

One key question for society is whether knowledge from social psychology can explain and reduce prejudice.

Prejudice is when an individual makes a judgement about another individual or group of people based on false ideas or stereotypical traits. This can result in the unfair treatment of groups or individuals in society.

Jane Elliott is a former schoolteacher and equal rights activist. While a teacher she conducted a class exercise on her third-grade pupils which became known as the 'blue eyes, brown eyes' study. On the first day she divided her class based on eye colour and told the children that the blue-eyed children were superior to the brown-eyed children. She gave extra privileges to the blue-eyed children and denied privileges to the brown-eyed children. The next day she reversed the roles. Throughout the days she observed the behaviour of the children towards one another. She observed the children in each group becoming prejudiced towards one another because of their eye colour.

Discuss the key question of whether knowledge from social psychology can help explain prejudice. You should use concepts, theories and/or research studied in your psychology course.

**CHECKPOINT**

1. Identify which type of conformity is being described in these examples:
  - a) An individual moves to a different country and adopts the customs and traditions of the new culture in order to become a citizen of that country.
  - b) A child chooses a cricket club and shows their support by wearing the team sports kit and praising their cricketing skills while at their matches.
  - c) An employee says that they agree with their supervisor's decision to reduce breaktimes even though the employee does not privately agree.
  - d) A student starts university and goes to parties with other students who they live with so they are part of the friendship group.
  - e) A guest at a restaurant doesn't receive his meal with others in his party and is rudely treated by the waiter. At the end of the meal the other members of the party leave a tip so the guest also leaves a tip even though he doesn't want to.
2. Select the correct result of Asch's (1951) study:
  - a) 32 per cent of participants made errors
  - b) 32 per cent of responses given were errors
  - c) 32 per cent of trials were errors.



**SKILLS**

ANALYSIS, COMMUNICATION,  
CRITICAL THINKING, PERSPECTIVE  
TAKING, REASONING

**EXAM PRACTICE**

1. Fezile is taking an enrichment course at school which involves volunteering for local charities. She is asked by her teacher to volunteer at a local primary school to help younger children learn to read. Fezile agrees to help the children, but has no interest in teaching young children, and would rather spend her time with her friends canoeing on the river. Fezile is also asked to volunteer to train young children to canoe, and chooses not to go canoeing with her friends so that she can teach the young children instead.
  - a) Describe, using compliance, why Fezile helped the young children to read. (2 marks)
  - b) Describe, using internalisation, why Fezile helped to train the young children to canoe. (2 marks)
2. Kasim is with a large group of friends at a youth club. His friends start ripping the material on the seat covers and drawing on tables. Kasim asks them to stop, but his friends laugh at him and give him a pen to join in. Kasim does not want to join in but he writes on the table. Describe, using conformity, why Kasim joins his friends in writing on the tables. (2 marks)

**EXAM TIP**

For any named study on the specification, you may be asked how the study could be improved. Review the weaknesses of the study as these are areas for improvement. Once you have identified an improvement, make sure you justify why it is an improvement to the original study.

For example:

Identify an improvement:

Asch (1951) could use a more representative sample that also included female participants instead of just the 50 male students.

Justify the improvement:

This would make his findings about conformity to a majority group more generalisable to a wider target population.

Identify an improvement:

A more realistic task, such as providing photographs of real objects, could be used to test whether individuals would conform to a majority group.

Justify the improvement:

This would increase the validity of Asch's findings about conformity in real-life situations.

# CHAPTER 3 MINORITY INFLUENCE AND INDIVIDUAL DIFFERENCES

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand explanations of minority influence
- understand factors affecting conformity and minority influence, including individual differences, situation and culture.

## GETTING STARTED

Social change often begins with a few people campaigning on an issue. Consider environmental change, such as reducing carbon/fossil fuels, recycling and reducing food waste.

- Can you name an environmental campaigner who started or headed these campaigns?
- What did they do to raise awareness of environmental change?
- What impact did they have?



▲ Many people now campaign about environmental issues

Majority influence explains how social order is maintained, but throughout history minorities have been observed to challenge this social order, and these challenges explain how social change occurs.

Minority influence is a form of social influence where people reject the established norms of the majority and move towards the behaviour and opinions of a minority group. By definition, minorities do not have power in numbers, but Serge Moscovici (1976) argues that their influence can be explained by their behavioural style. Successful minorities show consistent conviction in their views. Minority influence comes from informational social influence and results in individuals internalising new beliefs or behaviours.

Consider major social movements in society, such as feminism, civil rights, the 'right to education' and environmental change. These all began with a different viewpoint held by a minority. Such change could not have occurred without a consistent viewpoint being established and maintained, and minority individuals being dedicated to their cause.

Minority influence is rarely a quick process, but involves a gradual shift in majority opinion; this is known as the process of conversion, where individuals in the majority group gradually come to accept the minority viewpoint.

Minorities are rarely effective unless they show flexibility in their viewpoint and are not rigid in their beliefs. We perceive an uncompromising minority as extreme, so are less likely to believe in them. A minority which is flexible and accepting of alternative opinions is viewed as less extreme and more reasonable, so their viewpoint is more likely to be considered. This behavioural style can cast doubt or uncertainty over the beliefs of the majority, as their view is challenged and change is negotiated.

## SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

## ACTIVITY 1

Using the description of minority influence, identify two factors which can affect whether minorities are able to sway a majority.



## EVALUATION OF MINORITY INFLUENCE

Serge Moscovici et al. (1969) conducted a series of experiments to investigate minority influence on a colour perception judgement task. The task involved participants in a majority being swayed by incorrect judgements made by a minority in a group. Moscovici et al. found that minorities can exert some influence over majority opinion, particularly if the minority were consistent in their viewpoint. This research supports minority influence.

### LINK

Moscovici et al. (1969) is discussed in detail on pages 59–62.

Charlan Nemeth and Alice Brilmayer (1987) found evidence to support the idea that minority flexibility was an important factor in social influence. Using a mock jury study, 72 male students were asked to decide on how much compensation to award a victim of a ski accident due to negligence of a ski company. When a compensation offer suggested by a minority was consistent and uncompromising it was less effective than when an offer suggested was negotiated.

Minority influence can also be affected by individual differences and culture. Some individuals and cultures are more or less likely to be swayed by the opinions of others. Accepting a minority viewpoint can also be influenced by whether we identify with the minority group. According to social identity theory we are more likely to identify with a minority if they form part of our ingroup.

## FACTORS AFFECTING CONFORMITY AND MINORITY INFLUENCE

### INDIVIDUAL DIFFERENCES: PERSONALITY

Similar to obedience, there are individual differences between us that mean some people are more likely to conform than others. One such individual difference is the aspects of personality we have.

#### Locus of control

Locus of control is a belief system which determines our perception of control over events that occur. An individual with an internal locus of control may feel less pressure from others around them and be less likely to comply to group norms or feel a need to fit in. This means that they are likely to be less susceptible to normative social influence.

### LINK

Locus of control is discussed on pages 16–17.

An individual with an external locus of control tends to look to others to help guide their decisions and rely on others' opinions. This means that they are more susceptible to normative social influence.

John Biondo et al. (1971) found that students with an external locus of control were more influenced by overt attempts to persuade attitude change than those with an internal locus of control. Students with an internal locus of control reacted against overt influence and ignored subtle influence. Elaine Ritchie and Jerry Phares (1969) found that externals were more persuaded by communication from a source of high prestige than internals.

### KEY TERM

**meta-analysis:** when a researcher gathers and analyses other people's data to look at effect sizes to draw conclusions about research in a topic area

Theodore Avtgis (1998) conducted a **meta-analysis** on studies investigating locus of control and social influence. He found that most research indicated that those with a higher external locus of control score were more conforming than those with an internal locus of control. However, evidence in this area is mixed; some studies suggest a link between an external locus of control and higher conformity, but it is dependent upon the type and source of the persuasion. These findings reflect that there are many different factors that play a role in social influence.

#### Desire for control

As well as differing in our locus of control, Jerry Burger and Harris Cooper (1979) proposed that there are individual differences in our motivation to control events in our environment. An individual with a high desire for control tends to be assertive, decisive and take leadership roles within a group. An individual with a low desire for control tends to be passive and influenced



by others. According to this concept, someone with a high desire for control is more likely to resist other opinions and beliefs. Burger (1987) tested this hypothesis in an experiment which tested desire for control and conformity. Fifty-five student participants were placed in groups of four and asked to rate the funniness of a cartoon on a scale of 1–100. Each participant was presented with a series of cartoons and had to give their rating publicly after three other participants, who were confederates of the study, had given their rating. Burger found that participants with a high desire for control were less likely to conform to the group norm by agreeing with their judgements.

Other characteristics such as low self-esteem, high need for social approval, anxiety and insecurity can also explain variations in social influence.

### SITUATION

As demonstrated in the Asch experiments, the size of the majority has an impact on whether someone is likely to conform or resist social influence. Asch found that a majority of three was optimal, and any greater number did not exert greater influence. The size of a minority can also influence whether a majority can be persuaded, however research is mixed. A large minority has more visual presence than a small minority, and a small minority could be discounted as extreme or eccentric. However, a small minority can still be effective if their argument is strong and consistent. Majority unity can also influence conformity, as Asch found, when a majority is broken it reduced the rate of conformity from 33 to 5.5 per cent.

If a situation is ambiguous or uncertain, we are more likely to conform to the opinions of others around us because they provide a source of information that we need to make sense of a situation. This is a form of informational social influence which results in a more persistent change in attitude or behaviour.

The source of the influence can also have an impact. If a source has status, reputation, credibility or expertise, whether the source is a majority or minority, it will affect its ability to influence others. For example, environmental campaigners have credibility because their policy has scientific support and are led by prominent environmental activists, such as Greta Thunberg.

### CULTURE

Research has found that some cultures show greater conformity than others. Cross cultural replications of Asch-type experiments have shown different levels of conformity in different countries. Felix Neto (1995) found a higher rate of conformity among female Portuguese university students than Asch, and James Whittaker and Robert Meade (1967) found similar rates of conformity among Brazilian students to Asch, but Zimbabweans showed greater conformity. Subhas Chandra (1973) found that native Fijians were more conforming than Indians; the native Fijians displayed a rate of 36 per cent which was comparable to Asch's study of American students, and Ernst Timaueus (1968) found that German students were less conforming than Americans. Milgram (1961) found higher conformity in Norwegians, and Stephen Perrin and Christopher Spencer (1980) found a virtual absence of conformity in England. Harry Triandis et al. (1988) found Japanese students reported conforming less than US students in general and that the Japanese differentiated in-groups from out-groups more sharply as they were more likely to conform to other students than strangers.

In an early study of subsistence cultures, the Temme from Sierra Leone and the Canadian Inuit Berry reported different levels of conformity. The Temme exist on a single crop of food, so there is an annual effort to ensure that the crop is harvested, and this requires cooperation. The Canadian Inuit are hunter-gatherers, so rely less on collective effort in food collection. As such John Berry (1967) hypothesised that the Temme would display more conformity than the Canadian Inuit. Using an adaptation of Asch's line study, Berry found that the Temme showed higher rates of conformity than the Canadian Inuit, which could be explained by the cooperative values instilled in the culture because of food production.



**LINK**

As discussed earlier on page 18, collectivistic cultures place a greater emphasis on group cooperation and interdependence, so social norms are expected to be adhered to.

Individualistic cultures nurture greater independence and are more tolerant of dissent to social norms. Peter Smith and Rod Bond (1996) conducted a meta-analysis of 133 conformity studies which employed an Asch-type experimental procedure across 17 collectivistic and individualistic countries. They found that collectivistic countries tended to show higher levels of conformity than individualistic countries.

While we can draw general conclusions from this research, we must also consider that there are many variables that influence conformity, so the exact influence of socio-cultural factors cannot be determined.

**CHECKPOINT**

1. Name the research from its description.
  - a) A series of experiments was conducted to investigate minority influence in a colour perception task.
  - b) A compensation offer was more effective when the offer was negotiated and less effective when it was uncompromising. This shows that minority influence is more effective when it is flexible.
  - c) A meta-analysis showed that a higher external locus of control score was associated with greater conformity.
  - d) A study which found that participants with a higher desire for control were less likely to conform to confederate judgements about how funny a cartoon was.
  - e) Found the Temme displayed more conformity than Canadian Inuit because they required greater cooperation for food production.

**SKILLS**

COMMUNICATION, CRITICAL  
THINKING, PERSPECTIVE TAKING

**EXAM PRACTICE**

1. Explain one individual difference that may influence conformity and/or minority influence. (2 marks)
2. Explain one situational factor that may influence conformity and/or minority influence. (2 marks)
3. Explain one factor associated with culture which may influence conformity and/or minority influence. (2 marks)

# CHAPTER 4 METHODS: SELF-REPORTING DATA AND SAMPLE SELECTION AND SAMPLING TECHNIQUES

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand how to design and conduct a questionnaire and interview
- explain the issue of researcher effects
- understand what is meant by primary and secondary data
- describe and evaluate unstructured, semi-structured and structured interview, open and closed (including ranked scale) questions
- identify and write alternative hypotheses
- understand how psychologists select a sample of participants.

## GETTING STARTED

You will have come across questionnaires before, perhaps in other subjects you have studied, or maybe you have completed a questionnaire at school or received one through the post. Can you remember what the questionnaire was for, and the type of questions that were asked?

## SELF-REPORT DATA — QUESTIONNAIRES AND INTERVIEWS

A survey is a self-report method, used to gather information about how people feel, their attitudes and opinions, personality types and other traits. Surveys typically are designed to gather a large amount of information; this can be done through a questionnaire or large-scale interview.

### QUESTIONNAIRES

Questionnaires are designed to gather a large amount of data by accessing a large sample. Questionnaires can be administered by post, email, face to face or online, and often consist of questions that require information from participants about their attitudes, opinions, lifestyles and indeed any aspect of a person's life.

### Types of question

A questionnaire can gather different types of information or data. Quantitative data can be described as information that is numerical or can be converted into numbers. Qualitative data can be defined as information that is non-numerical prose. The type of question asked in a questionnaire can produce either quantitative or qualitative data.

Closed questions are questions that have preset fixed answers that a respondent has to select from by circling or ticking the one that is the closest match to their opinion. Closed questions yield quantitative data. These can be yes/no response questions or where a list of options is available.

Closed questions can be fixed choice, such as yes/no or a list of options. Here are some examples:

- Do you have a pet? Yes/No (please circle)
- Age: 18–40 years/41–60 years/60+ years (please circle)
- How regularly do you send text messages? Daily/A few times a week/Occasionally/Never (please circle)



Although respondents find closed questions easy and quick to answer, and researchers can easily analyse this type of data, they can be frustrating if the possible answers do not match what the participant would like to express. They are also very limited in the amount of information that can be analysed; a researcher cannot know why a respondent has answered in that way, so the level of detail obtained is limited. Attitude scales have been designed to increase the level of detail achieved in a questionnaire.

Attitude scales involve more than a yes/no response, instead offering respondents a range of different options so that their strength of opinion can be gauged. A Likert-style scale involves a respondent selecting from a fixed set of options to rate their agreement to a series of statements (see Figure 4.1).

► Figure 4.1 An example of a Likert scale question

I am happy with my purchase today.				
5	4	3	2	1
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

### LINK

A Likert scale was used in the Adorno et al. survey on authoritarianism (see page 16).

Likert scales involve respondents rating their opinion, and ranked scales involve a respondent ranking their choices relative to other options. To score ranked questions, each preference should be given a weighting. For example, if you ask respondents to rank animals according to how fearful they are of them, the most feared animal would have to be given a higher weighting than the least feared. The animal with the highest score will represent the most feared animal.

Open questions do not involve preset answers, but instead allow respondents to answer freely. This allows them to elaborate on their answers and justify their opinions. However, it does require more time and effort on the part of the respondent and open-ended question responses require qualitative analysis (see page 54), which can lead to subjective interpretation on the part of the researcher.

### SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

### ACTIVITY 1

Imagine you are designing a questionnaire to investigate the popularity of different A level subjects at your school. Design a questionnaire using as many of the different types of question as you can.

### MATHS TIP

Objective means not open to interpretation, while subjective means open to interpretation. For example, if you ask someone to estimate the length of a classroom table, it is likely that their estimation will differ from someone else's. This is a subjective interpretation. However, if you ask someone to use a ruler to measure the length of the classroom table, it is likely that their measurement will be exactly the same as someone else's. This is an objective measure.

Quantitative data is objective because numbers are numbers, and therefore not open to interpretation.

Qualitative data can be subjective because the meanings found in prose can be open to interpretation.



## ISSUES WITH QUESTIONNAIRE DESIGN

Questionnaires can be a useful way of finding out about people's attitudes, beliefs and opinions. However, there are issues with designing and conducting questionnaires which need to be considered.

### Social desirability

Social desirability occurs when a respondent does not give a genuine answer, but one which depicts them in a more favourable light. That is, they respond to a question in a way that is seen as desirable according to prevailing social norms. For example, very few respondents would say that they agree with cheating during an exam because their responses would be contrary to current social norms and they would be seen in a negative light. This can be particularly problematic for research that investigates socially sensitive issues or attitudes that go against social norms. However, many questionnaires are designed in a way that helps researchers detect socially desirable responses.

#### EXAM TIP

You may be asked to give a strength or weakness of questionnaires as they are used in social psychology. This requires your answer to relate to social psychology specifically.

For example:

One weakness with using questionnaires in social psychology is that participants may answer in a way that portrays them in the best possible light: social desirability bias may occur. This means that people may say that they are more obedient than they actually are because they don't want people to think they are disobedient.

#### KEY TERM

**privacy:** participants should not be asked personal questions that they may find intrusive, and the researcher must not obtain personal data that a participant would not voluntarily disclose

### Question construction

Designing questions for a questionnaire can be tricky. As a researcher may not be present when the questionnaire is being completed, it is very important that questions are not too technical, ambiguous or complex. It is also important that questions do not lead or mislead a respondent into giving a particular answer. There are also guidelines about the sorts of personal questions that can be asked without violating the right to **privacy**.

When designing Likert-style scale statements, it is important to consider the number of options provided because an odd number of possible answers to a scale means that the middle value may be selected more frequently. Using an even number of answers on a scale forces respondents to make a choice rather than select a 'neutral' or 'neither agree nor disagree' option.

Response bias can occur when using Likert-style scales. If all the statements in a set of statements are worded favourably or unfavourably, respondents can slip into just agreeing or just disagreeing with all of them. To resolve this, statements should be reversed and mixed up (see Table 4.1 for examples).

TABLE 4.1: REVERSED STATEMENTS FOR LIKERT-STYLE SCALES

Example statement	Reversed statement
Employment helps society to function.	Employment does not help society to function.
Pets make people happy.	Pets do not make people happy.
Politicians help the economy thrive.	The economy can thrive without politicians.



## KEY TERMS

**concurrent validity:** a way of establishing validity that compares evidence from several studies testing the same thing to see if they agree

**external reliability:** refers to the consistency of a measure

**face validity:** looking at each question and deciding whether it makes sense in terms of the construct being measured

**internal reliability:** refers to the consistency of a measure within itself

**predictive validity:** the extent to which results from a test or a study can predict future behaviour

**split-half method:** splitting the questions into two halves and comparing the findings from both halves during analysis to ensure reliability

**test-retest method:** the same people are given the same questionnaire to complete again on a different occasion

## QUESTIONNAIRE RELIABILITY

Reliability refers to the consistency of a measure or finding. **External reliability** refers to the consistency of a measure or finding over time. **Internal reliability** refers to the consistency of a measure within itself. Some questionnaires and scales lose their external reliability if respondents repeat them on different occasions, so it is important to establish whether this is the case by using the **test-retest method**. This literally means that the same people are given the same questionnaire to complete again on a different occasion. If their responses are the same or very similar, external reliability can be established.

Internal reliability is a problem for questionnaires because often several different questions are used to measure the same trait or attitude. To establish internal reliability, a **split-half method** can be employed. This involves splitting the questions into two halves and comparing the findings from both halves during analysis. If all of the questions are measuring the same concept, both halves should achieve the same score. If they do not, it suggests that some of the questions may be measuring a different concept.

## Questionnaire validity

Validity refers to the extent to which something is measuring what it intends to measure. If you design a questionnaire intending to measure attitudes about education, then you need to be sure that you design your questions so that they measure this attitude and nothing else. Sometimes this can be established by simply looking at each question and deciding whether it makes sense in terms of the construct being measured. This is known as **face validity**. This can also be confirmed by asking an expert in the field to review the questions. If a questionnaire is a valid measure of a construct, such as intelligence, then it should have **predictive validity**. This means that it can accurately predict the same construct in the future. If an intelligence test has predictive validity, a high intelligence score should correlate with educational success, such as A level or degree grading. Another way of establishing whether the questions in a questionnaire are valid is by comparing it to another test measuring the same construct. This is known as **concurrent validity**.

## ACTIVITY 2

Imagine that you have been asked to conduct research into the ways in which people use social media. You need to design a questionnaire that gathers information from people about their use of social media.

Working in pairs or small groups, devise ten questions that could be used in the questionnaire. Try to include different types of questions, such as open-ended questions and closed-ended questions, answer options and ratings. Try the questions on a different group.

- Were the questions clear?
- Were any questions misleading or sensitive?
- What kinds of answers did you get?
- How might you analyse the answers?

## SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION, TEAMWORK,  
COLLABORATION

## INTERVIEWS

An interview is when respondents answer questions directly, rather than writing them. This can take the form of a conversation, or simply answering preset questions asked directly by the researcher. Interviews can be structured, semi-structured or unstructured.

## Structured interviews

Structured interviews are defined by the nature of the questions and the way in which they are asked. Typically, structured interviews are standardised so that all respondents are asked the



same preset questions in the same way. Structured interviews tend to be easy to administer and it is not necessary to establish a rapport between the researcher and respondent. They can also be easily repeated. However, the data gathered can be superficial and lack depth, and the respondent may feel stifled and unable to express their opinions fully.

### Semi-structured interviews

Semi-structured interviews are more conversational and dynamic. A researcher has preset questions that they aim to be answered, but do not have a standardised format to follow and can deviate from the script. This means that the conversation can flow a little bit better, while still achieving the research aim and getting other relevant information from respondents. This type of interview can gather both quantitative and qualitative data.

### Unstructured interviews

This type of interview begins with a loose research aim and gathers information from respondents in the form of a conversation. Unlike structured interviews, the interviewer needs to be analytical during the interview so that they can probe and seek meaning from respondents. An unstructured interviewer needs to be skilled at achieving a good rapport with respondents and be responsive to the information offered; they need good listening skills and should use non-judgemental language. Unstructured interviews are more time consuming to conduct and analyse the data from, and they are not replicable as different questions are asked in each interview.

#### SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

### ACTIVITY 3

Identify which type of interview is being described:

1. A researcher wants to investigate how friendships are formed. They decide to write specific questions that they will ask people in friendship groups.
2. A researcher has a conversation with students in the dining room to find out which meals they prefer.
3. A researcher wants to investigate what pets people own. They want to know what type of pets people have and how long they have owned them, but also want to explore the reasons for owning pets.

Ethical issues are important when conducting any type of questionnaire or interview, but critical when using an unstructured interview because the qualitative data gathered can make direct reference to quotes from respondents. It is important that all respondent details are anonymised, and personal details disguised. Due to the reflexive nature of an unstructured interview, the interviewer must behave sensitively when asking for personal information to ensure they do not breach the respondent's right to privacy.

### Researcher effects

When asking people questions, there are many interviewer characteristics that can influence the respondent; the biological sex, age, manner and personality of the interviewer can all affect how a person responds, whether they are truthful, and whether they disclose information at all. It is, therefore, important to predict what characteristics might influence respondents and control them. For example, you can predict that a male interviewer will be unlikely to obtain detailed information from a female participant about their view of friendships within their peer group. This can be controlled by employing a female interviewer.

Researcher effects can also refer to unintended influence that a researcher can introduce because of their expectations of the research, such as smiling in approval at a respondent's answer. A researcher may inadvertently ask questions that serve to confirm their expected outcomes of the study, which is known as **confirmation bias**. Researcher effects can be reduced by using an independent researcher who is trained in interviewing techniques, but is not aware of the study aims.

#### KEY TERM

**confirmation bias:** when a researcher conducts research in a way that confirms the intended outcomes



**EXAM TIP**

You may be asked to give a strength or weakness of interviews as they are used in social psychology. This requires your answer to relate to social psychology specifically.

For example:

One strength of using interviews in social psychology is that in depth answers contain detailed information and reasons why individuals may consider others to have authority or power. This increases the validity of the data gathered by social psychology researchers about topics such as obedience.

**KEY TERM**

**literature review:** when a researcher reads, summarises and draws conclusions from other people's research

**LINK**

You will learn more about hypothesis construction in Topic B: Cognitive psychology (see Chapter 11).

**PRIMARY AND SECONDARY DATA**

Primary data is gathered directly by a researcher from participants or sources, typically using a research method such as an experiment, observation, survey or content analysis. Secondary data is gathered from existing studies conducted by other researchers, such as when conducting a **literature review** or meta-analysis. Primary data is first-hand data, and therefore is specifically gathered according to the aims of a study, whereas secondary data is second-hand data, and may be slightly different and not specific to the aims of a researcher. Primary data is time consuming to collect because a researcher must gather participants and design and conduct the research themselves, whereas secondary data has already been collected, so just needs to be analysed and compared. Secondary data may be out of date compared to primary data which is current. However, secondary data can be useful as large amounts of data can be gathered from many studies, which can give an overview of many studies in one area of research.

**ALTERNATIVE HYPOTHESES**

In addition to an overall research aim, a study also makes a prediction about what is likely to occur. This prediction is known as an alternative hypothesis. A hypothesis should contain the variables under investigation and be a clear, testable and precise statement at the beginning of a study. This prediction is often guided by previous research in the topic area, but if there is limited previous research or mixed findings, the prediction may have to just state that a difference or relationship might be found between the variables under investigation, but not what direction the difference/relationship may take.

**SAMPLING TECHNIQUES**

In psychological research it is necessary to recruit participants or respondents to study. The way in which these participants are selected is known as sampling. It is unlikely that a whole population can be studied, so a sample of the population needs to be gathered using a sampling technique. The technique used will depend on the type of research being conducted and the availability of the participants, but the aim of a sampling method is to select a representative sample of participants; that is, a sample that represents the characteristics of the population well. This will ensure that any conclusions drawn from the research can be successfully generalised back to explain the behaviour of the target population as a whole.

**TARGET POPULATION**

A target population is the population of people being investigated by a study. For example, if you are investigating attitudes about health services at a local hospital, the target population will be people at the hospital. A sample will be recruited from this target population using a sampling technique.

If the sample gathered is not representative, because of an over- or under-representation of a particular type of participant in the sample, a sampling bias will occur.



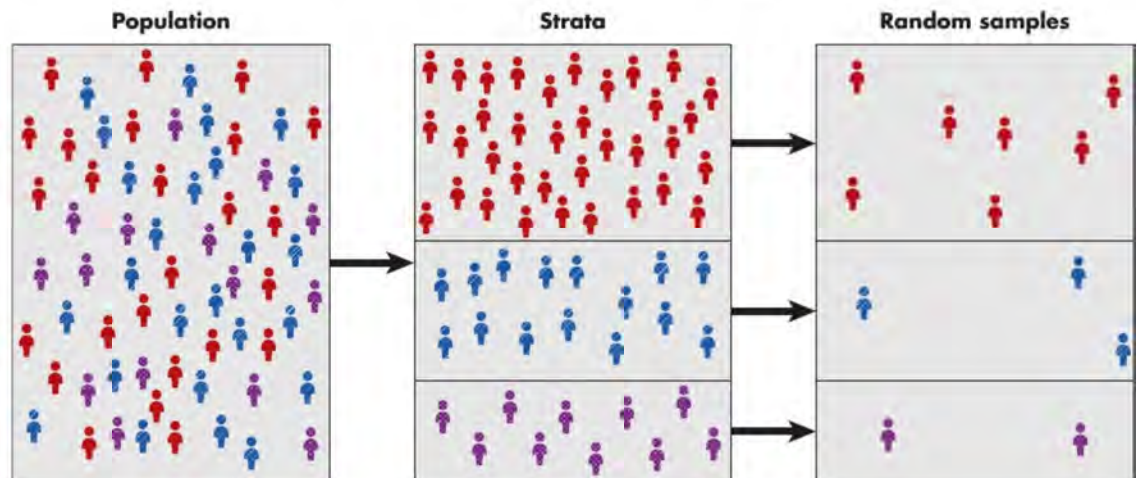
### STRATIFIED SAMPLING

The most likely way to recruit a representative sample of a target population is by using a stratified sampling technique. If the target population has certain subgroups that need to be represented in the sample, a stratified sampling technique can be useful in recruiting the correct number of participants in these subgroups. The target population needs to be divided into its subgroups, and the percentage of members of each subgroup should be calculated. For example, if certain age groups of a target population need to be proportionately represented, the percentage of participants within each age group should be calculated. So if a target population is 50 per cent children and 20 per cent teenagers, the sample needs to represent these percentages. Once the subgroup percentages are calculated, a proportionate number of each subgroup should be randomly selected.

Stratified sampling is useful if subgroups in a population are unequal or need to be represented in a sample. For example, if you are researching stress in the workplace in a company, you can find out how many staff occupy different roles within the company, for example office clerks, managers, canteen staff, cleaners. As there may be more clerks than managers, more clerks need to be recruited for the study than managers to represent the company staff more fairly.

Stratified sampling is the most representative sampling method, but a researcher still needs to ask those selected to take part in their research, and they may not agree to take part.

► Figure 4.2 Stratified sampling ensures that each different part of the population is proportionally represented in the sample



#### EXAM TIP

If you are asked to describe 'how' a sampling technique is used, treat this as a process: firstly, secondly, thirdly. This will ensure you access the available marks.

Example:

Crystal has been asked by her employer to send out questionnaires asking opinions about whether the food served in the office canteen is good. There are 100 employees who use the canteen at lunchtime and work in the office building. Describe how Crystal might gather a stratified sample of the employees in the office building. (3 marks)

Firstly, Crystal would decide which subgroups exist in the office building, such as managers, clerks, cleaners.

Secondly, Crystal would calculate the percentage of managers, clerks and cleaners that represent the whole range of the target population in the office building.

Thirdly, she would randomly select the proportionate number of employees in each subgroup and ask if they would complete the questionnaire on how good the food was in the office canteen.



### RANDOM SAMPLING

A random sampling technique should ensure that everyone has an equal chance of being selected. A random sample can be achieved in several ways. Computers can produce random sequences of numbers, so every person in a target population can be assigned a number, and the computer-generated numbers can be used to select a sample if the numbers correspond. A simpler way would be to place the names of every member of the target population into a hat, shuffle them and draw at random. Once a random list of names has been generated, the participants can be contacted to see if they wish to take part in a study.

Random sampling should result in a representative sample, although this may not always be the case because you can select an unrepresentative sample at random, too. Even if your random sample is representative of the target population, you still need to obtain consent from each participant selected. If they decide to not take part, you may be left with an unrepresentative sample in the end. Similar to stratified sampling, random sampling is time consuming as each member of a target population needs to be identified.

### OPPORTUNITY SAMPLING

An opportunity sample makes use of participants who are readily available by asking them to take part. This can involve a researcher going to a student common room and asking people to take part, or investigating passers-by in a street. Either way, the researcher has limited control over who is recruited and not everyone in a target population has an equal chance of being selected because they may not be available at the time. Asking people directly can be unethical as it puts pressure on them to participate.

#### EXAM TIP

If asked to define a sampling method, you can gain more marks if you give an example.

For example:

Opportunity sampling uses participants who are available at the time, for example gathering students who are available in the common room at the time of the study and who agree to take part when asked.



People taking part in a survey ►

### VOLUNTEER SAMPLING

Self-selected participants can be recruited by placing an advert in a newspaper or a student common room. Volunteers are self-selecting because they choose to take part: they are not approached and asked by a researcher, so it is considered a more ethical sampling method. However, the researcher has no control over who volunteers and often a certain type of participant may choose to take part, and only those people who see the advert and have the time to participate are going to volunteer. This can result in a sample bias which limits the generalisability of the study conclusions.



## SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

## ACTIVITY 4

Identify the sampling bias in the following examples:

- a) A researcher recruits student participants in the canteen at lunchtime to find out about attitudes towards A level reforms.
- b) Participants volunteer to take part in a study about career choices by responding to an advert in a women's magazine.
- c) A researcher uses the telephone directory to gather a sample of participants for a study on health-related behaviour.
- d) Attitudes towards a new school uniform policy are gathered from students recruited from a school common room.

Now suggest the likely impact of the sampling bias on the conclusions of each study.

## CHECKPOINT

1. Decide whether the following examples are gathering primary or secondary data:
  - a) Marco was interested in research into conformity in the workplace. He read an article on how employees dress similarly to others in their workplace, and wanted to find out more so he read more articles. Name the type of data Marco used in his research.
  - b) Philipina was interested in different types of social power and how they can influence people to recycle and reduce waste. She decided to conduct a questionnaire to investigate whether people in her city were influenced by different public officials who promoted recycling and reducing waste. Name the type of data Philipina used in her research.
2. Identify the target population in these examples:
  - a) Asking teachers at a school about their views on canteen food.
  - b) Using a gym membership list to recruit participants for a survey about exercise.
  - c) Stopping people in a street to take part in research.
  - d) Investigating stress at work in an office building.

## SKILLS

COMMUNICATION, CRITICAL  
THINKING, INTELLECTUAL  
INTEREST AND CURIOSITY,  
INTERPERSONAL SKILLS

## EXAM PRACTICE

1. Carlos wants to test how compliant pedestrians are to signs which ask them to 'keep off the grass'. He designs a questionnaire to gather quantitative data from pedestrians who visit a local park.
  - a) State one closed question that Carlos could use in his questionnaire about obedience. (1 mark)
  - b) State one open question that Carlos could use in his questionnaire. (1 mark)
  - c) Carlos decided to recruit participants using an opportunity sampling technique. Explain how Carlos would go about recruiting participants for his study. (2 marks)
  - d) Explain one weakness of Carlos using an opportunity sampling technique for his questionnaire. (2 marks)
2. Evaluate experimental designs as they are used in memory research. (8 marks)



**CHAPTER 5****METHODS: ANALYSIS OF QUANTITATIVE DATA AND ETHICAL GUIDELINES****LEARNING OBJECTIVES**

By the end of this chapter you should be able to:

- understand how to analyse and present quantitative data
- describe and evaluate the analysis of qualitative data using thematic analysis
- understand the British Psychological Society (BPS) Code of Ethics and Conduct, and risk management when carrying out research in psychology.

**GETTING STARTED**

A psychology researcher gathered data on a range of variables from a sample of students. The table below shows the average scores for each variable for sports students and science students.

In pairs or a small group, consider the trends presented in this table. What does the data tell us about the students?



▲ What factors help to increase test scores? Sleep, exercise or how much time is spent revising?

	Sport students	Science students
Average sleep per night (hours)	8	9
Average time spent revising each day (mins)	50	90
Average time spent exercising per week (hours)	25	5
Average percentage grade on a recent test	70%	71%
Average number of merits achieved over a year	12	11
Average peer group size	8	4

Once an investigation has been conducted, the findings of the study need to be analysed. Investigations can produce quantitative data or qualitative data.

Investigations that gather quantitative data produce numerical results called raw scores.

**DATA TABLES**

Data tables are used to present the quantitative data found in an investigation. Data tables can present the raw data gathered, or frequencies, measures of central tendency and dispersion can be presented.

**RAW DATA TABLE**

When data has been gathered it is often initially presented in a raw data table. A raw data table is a table of all the individual values measured in the study.



Looking at Table 5.1 of raw scores, it is noticeable that females rated themselves as more obedient than males. Not all raw scores show an obvious trend, so other tables can be used to analyse the findings more clearly.

TABLE 5.1: THE INDIVIDUAL SELF-RATINGS OF OBEDIENCE (OUT OF 10) OF MALES AND FEMALES

Males	Females
3	7
5	9
4	6
6	8
4	7
3	6
4	9

### FREQUENCY TABLE

A frequency table shows how many times (the frequency) the scores occurred in a data set. Table 5.2 clearly indicates that females frequently gave a higher obedience rating for themselves than males. Males self-reported lower obedience.

TABLE 5.2: THE FREQUENCY OF RATINGS OF OBEDIENCE FOR MALES AND FEMALES

Self-rated obedience	Males	Females
3	2	
4	3	
5	1	
6	1	2
7		2
8		1
9		2

### MEASURES OF CENTRAL TENDENCY

This raw data can be difficult to draw conclusions from, so it is summarised to make it easier to see the trends being shown and to highlight the differences between groups. Data can be summarised using **descriptive statistics**; that is, calculations of the measures of central tendency and dispersion.

Central tendency is a descriptive statistic that calculates the average or most typical value in a data set; that is, the average score recorded. The average score can be calculated in different ways.

#### The arithmetic mean $\bar{X}$

The arithmetic mean is calculated by adding up all of the values in a data set and dividing the total by the number of scores collected.

#### KEY TERM

**descriptive statistics:** calculations which describe trends from raw data; these include calculating the mean, median, mode and standard deviation



## KEY TERMS

**interval/ratio data:** data where an individual score for each participant is gathered, and the score can be identified using a recognised scale with equal distances between each score, for example time, height

**nominal data:** where data forms discrete categories, for example hair colour can only be nominal data because it can only be described in its categories of, for example, blonde, brown, red or black

**ordinal data:** a level of measurement where numbers are rankings rather than scores in themselves, e.g. a rank order for attractiveness on a scale of 1 to 5

The formula for calculating the mean is:

$$\bar{X} = \frac{\sum X_i}{n}$$

Where:

$\bar{X}$  = mean

$\Sigma$  = sum of

$n$  = number of scores

For example:

Data set: 3, 5, 7, 9, 10, 11, 13

$\Sigma X_i = 58$

Divided by the number of scores = 7

$\bar{X} = 8.3$

The mean is the most sensitive and therefore the most powerful measure of central tendency because all the scores in the data set are used in the calculation, but it can be affected by extreme values. The mean is often used on **interval/ratio data** (see page 54).

## The median

The median is a measure of central tendency that calculates the middle value when the values in the data set are placed in rank order (from smallest to largest). When the data set has an odd number of scores, it is simply the middle value. However, if there is an even number of scores, the mean of the two middle values needs to be calculated.

For example:

Data set with an odd number of scores: 3, 6, 8, 9, 10 = the median score is 8.

Data set with an even number of scores: 3, 5, 6, 7, 8, 9 = a mean of the middle scores 6 and 7 gives a median score of 6.5.

The median is a simple calculation of the average score and is not affected by extreme scores. However, it is less sensitive than the mean as it does not include all the values in its calculation and is not useful on data sets that have a small number of values as it may not represent the typical score. The median is typically used on **ordinal data**.

## The mode

The mode is a measure of central tendency that calculates the most frequent score in a data set. The mode is the value that occurs most frequently.

Data set: 2, 2, 3, 3, 4, 4, 4, 6, 7, 7, 7, 7, 9 = a mode of 7, the most frequent score.

If there are two most frequent scores, it is referred to as bi-modal and both should be reported. However, if more than two modes are seen the mode becomes a meaningless measure of central tendency. The mode is used on **nominal data** and is very easy to determine. It is not affected by extreme scores. However, it is not a useful measure of central tendency on small data sets and is less sensitive than the mean as not all the values are included in the calculation.

## MATHS TIP

Remember to rank the scores from smallest to largest before you try to work out the middle score. Check the data to make sure you are not using the median on small data sets.

## SKILLS

CRITICAL THINKING, ANALYSIS

## ACTIVITY 1

Copy the key terms into your notebook and match them to the correct definition.

## Key term

Mean

Median

Mode

## Definition

The most frequent value in a data set

The arithmetic average of a data set

The middle value in a data set

## KEY TERMS

**interquartile range:** a measure of dispersion that tells us the difference between the highest and lowest score for the middle half of scores in a data set

**range:** a measure of dispersion that tells us the difference between the highest and lowest score in a data set

**standard deviation:** a measure of dispersion which calculates the average deviation of scores from the mean

## MEASURES OF DISPERSION

Dispersion is a descriptive statistic that calculates the spread of scores in the data set. Measures of central tendency can be misleading if you do not know the variation between the scores. There are different types of measures of dispersion.

## Range

The **range** is the simplest calculation of dispersion; it is simply the difference between the highest and lowest value. The range is calculated by subtracting the lowest value from the highest value. A high range value indicates that the scores are spread out and a low range value indicates that the scores are closer together.

For example:

Data set: 2, 4, 6, 8, 9, the range is  $9 - 2 = 7$ .

The range is affected by extreme scores, so may not be a useful descriptive statistic if there are outliers in the data set. It also does not tell us if the scores are bunched around the mean score or more equally distributed around the mean.

If a data set has extreme scores, it is often better to calculate the **interquartile range**. This involves cutting out the lowest quarter and highest quarter of values (the top and bottom 25 per cent) and calculating the range of the remaining middle half of scores.

## Standard deviation

A more useful way of looking at the spread of scores is to understand the concept of deviation. Deviation refers to the distance of each value from the arithmetic mean. For example: if the mean average rating for obedience given by the male participants was 7, and one male within the group was rated 9, the deviation of his score would be +2. If a different male in the group rated himself as 5 on an obedience scale, the deviation value would be -2.

Clearly each score in a data set would have a deviation value, so to get a single value that represents all deviation scores the **standard deviation** needs to be calculated. The standard deviation gives a single value that represents how the scores are spread out around the mean. The higher the standard deviation, the greater the spread of scores around the mean value.

The formula for the standard deviation of a sample is:

$$SD = \sqrt{\frac{\Sigma(X - \bar{X})^2}{n - 1}}$$

To calculate the standard deviation, it is useful to look at an example.

TABLE 5.3: EXAMPLE OF STANDARD DEVIATION

Score ( $X$ )	Mean $\bar{X}$	Deviation ( $X - \bar{X}$ )	(Squared deviation $(X - \bar{X})^2$ )
70	100	-30	900
80	100	-20	400
90	100	-10	100
100	100	0	0
110	100	10	100
120	100	20	400
130	100	30	900
			Sum of deviations squared = 2800



1. In Table 5.3 each score has had the mean score subtracted to give the deviation score.
2. Each of these deviation scores need to be squared to give the squared deviations (final column).
3. The sum of the squared deviations should be calculated.
4. Now divide the sum of the squared deviations by the number of scores in the data set minus 1. In this example the sum of squared deviations is 2800 and the number in the sample  $(7) - 1 = 6$ . 2800 divided by 6 is 466.6. This figure is known as the variance.
5. The square root of this variance  $(466.6) = 21.6$ . This is the standard deviation.

**MATHS TIP**

In the exam, you can use a calculator to work out the mean and the standard deviation. You will need a calculator that can perform statistical calculations or a standard calculator (although this will take a bit longer).

Using a scientific calculator: input each value one at a time, using the 'add' button to do this. Once all scores have been added, press the  $\sigma_n - 1$  symbol button.

Using a standard calculator: calculate the mean of the data set. Subtract each value in the data set from the mean to find the deviation of each score. Square each deviation by multiplying it by itself (for example  $20 \times 20$ ). Find the sum total of the squared deviations and divide this figure by the number of scores in the data set and minus 1 to find the variance. Find the square root of the variance to calculate the standard deviation.

If you do use a calculator, note that this should be used to check your answer. In the exam, you will need to show all of your workings.

**SKILLS****CRITICAL THINKING, ANALYSIS****ACTIVITY 2**

Identify which calculation is a measure of central tendency and which is a measure of dispersion:

Mean

Range

Mode

Standard  
deviation

Median

**EXAM TIP**

If you are asked to calculate a sum in the examination, you must show your workings as well as the figure for the numerical sum achieved.

**SUMMARY TABLES**

Summary tables represent measures of central tendency and dispersion clearly.

TABLE 5.4: SUMMARY TABLE SHOWING THE SELF-RATED OBEDIENCE SCORES OF MALES AND FEMALES

	Males	Females
Mean obedience rating ( $\bar{X}$ )	4.1	7.4
Median obedience rating	4	7
Mode obedience rating	4	6, 7 and 9
Range of obedience ratings	3	3
Standard deviation ( $\sigma\bar{X}$ )	1	1.2

Looking at Table 5.4, it is clear that the typical score representing the rating of obedience is higher for females than males. The modal score for females is not useful as three modes have been calculated. The spread of scores, indicated by the range, is the same for both male and female ratings, and the standard deviations are also similar. This suggests a roughly equal

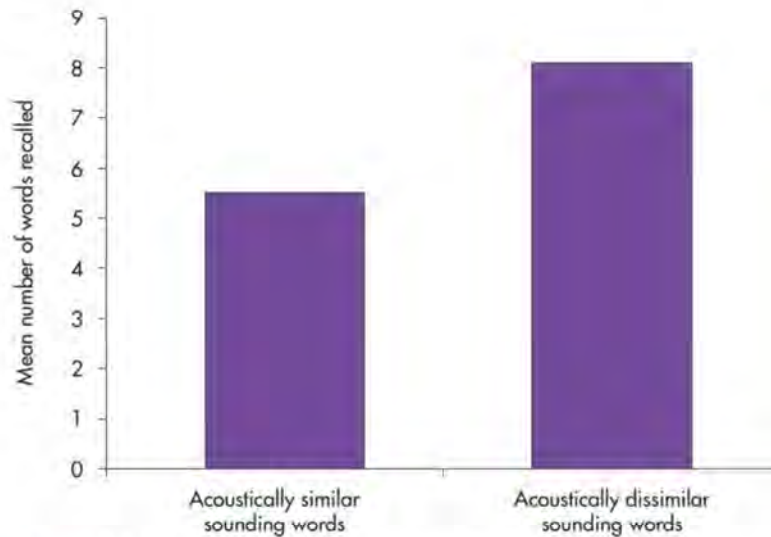
**EXAM TIP**

If you are asked to interpret a data table or graph, you will need to describe the trends and features of the data that is presented. You must refer to the data presented to justify your conclusions.

spread of scores around the mean for both conditions. The conclusion from this fictitious data is that females consistently rate themselves as more obedient than males, and that males consistently rate themselves as less obedient than females.

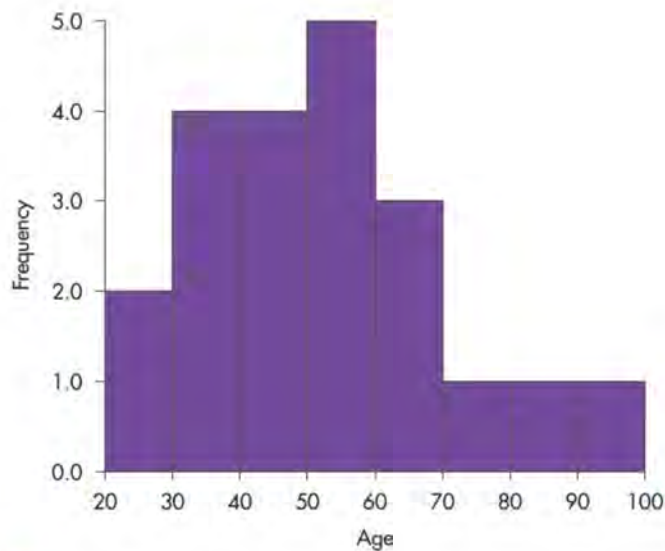
**GRAPHICAL REPRESENTATION OF DATA**

Graphs can be useful to illustrate summary data or data frequencies. Bar charts are used to present data from a categorical variable, such as the mean, median or mode. The categorical variable is placed on the x-axis and the height of the bars represents the value of that variable, as shown in Figure 5.1.



▲ Figure 5.1 A bar graph showing the mean number of words recalled

A histogram is used to present the distribution of scores by illustrating the frequency of values in the data set (see Figure 5.2). Unlike a bar chart, where the bars are separated by a space, the bars on a histogram are joined to represent continuous data rather than categorical (discrete) data. The possible values are presented on the x-axis and the height of each bar represents the frequency of the value.



▲ Figure 5.2 A histogram

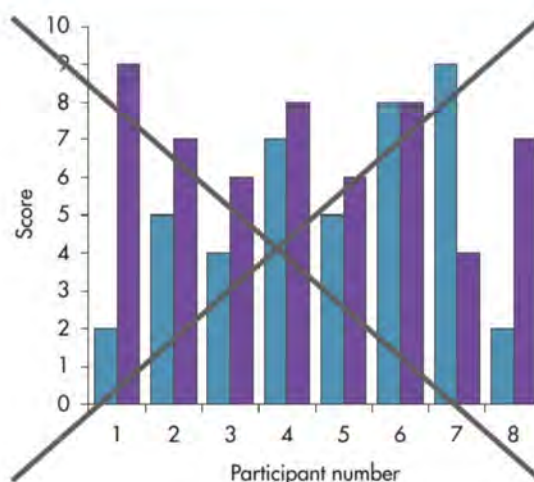
**EXAM TIP**

You may be asked to draw a graph in the exam using values given in a table. You must plot the values carefully in the graph and label both axes clearly. You must give a title to your graph.



**MATHS TIP**

Patterns within the data may be easier to see if the data is grouped before being shown on a graph. Raw scores in a graph are very difficult to interpret, look messy and are not useful to draw conclusions from (see Figure 5.3). Graphical representations are supposed to be meaningful and summative; using raw data does not achieve this.



► Figure 5.3 It is not useful to put raw data in a graph

**NORMAL AND SKEWED DISTRIBUTION**

Psychological research can use small samples of participants where only measures of central tendency and dispersion are useful descriptive statistics. When larger samples are gathered, it may be more useful to examine the overall distribution formed by the gathered data. Distribution tells us the overall frequency of the values in a data set. Examining distribution can show trends in the data that cannot be detected using small samples, and we can estimate the distribution of scores in the whole population.

Table 5.5 is an example of the distribution of self-rated obedience scores in a group of individuals gathered using a Likert-style question on a questionnaire (the raw data is shown in Table 5.6).

TABLE 5.5: THE FREQUENCY DISTRIBUTION OF SELF-REPORTED OBEDIENCE SCORES

Self-reported obedience scores	Frequency	Percentage
1	1	2.04
2	2	4.08
3	3	6.12
4	4	8.16
5	5	10.20
6	6	12.24
7	7	14.29
8	6	12.24
9	5	10.20
10	4	8.16
11	3	6.12
12	2	4.08
13	1	2.04
Sum total = 49		Cumulative percentage = 100%

TABLE 5.6: RAW DATA FOR SELF-REPORTED OBEDIENCE

1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6, 7, 7, 7, 7, 7, 7, 8, 8, 8, 8, 8, 9, 9, 9, 9, 10, 10, 10, 10, 11, 11, 11, 12, 12, 13
--

### Percentage

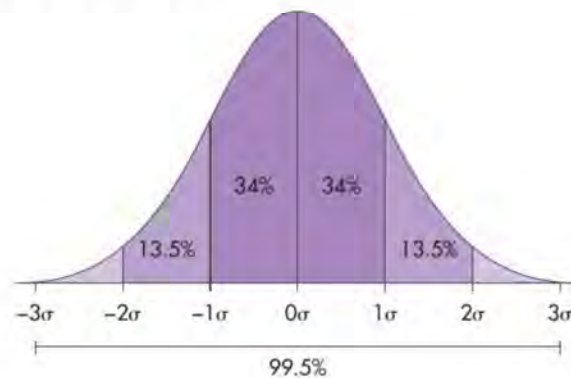
The percentage score gives an overall indication of the relative proportion of people who achieved a particular obedience score. To calculate a percentage score, divide the number of people who achieved a particular score by the total number of people and multiply the answer by 100.

For example, 5 people achieved an obedience score of 9. This score should be divided by the sum total of 49 (the total number of people) and multiplied by 100; that is,  $\frac{5}{49} \times 100 = 10.20$ . This means that 10 per cent of the participants achieved an obedience score of 9.

### Normal distribution

We can calculate and plot the distribution of scores in a data set to look for patterns. As we have seen, the frequency of scores can be plotted on a histogram to show how many times each value occurs for a category or interval. We can also plot the frequency of values using the standard deviation as a measure of dispersion. This will allow us to see whether the scores are normally distributed. For example, if you were to calculate the standard deviation for height in a population, we would find that the greatest frequency of scores would be gathered around the average (mean, median and mode) height, and the less frequent scores further away from the average height. When the frequency distribution of a population is calculated, it can be represented on a frequency graph. If the graph illustrates a bell-shaped curve, the data has a normal distribution, as shown in Figure 5.4.

Standard deviation is given the symbol  $\sigma$ . So  $1\sigma$  means one standard deviation.



► Figure 5.4 A normal distribution curve

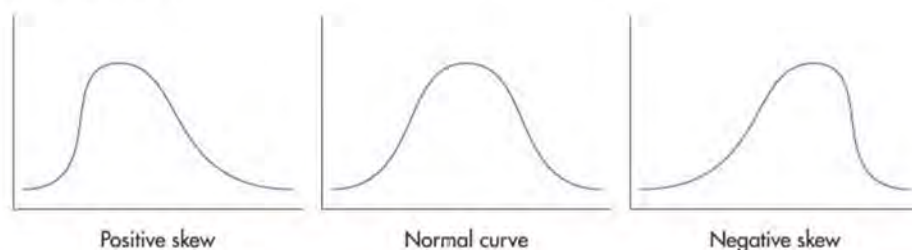
The normal distribution is characterised by its symmetry around the mid-point. The mean, median and mode should be aligned around the mid-point. The tail ends should not meet the horizontal axis. The normal distribution can be used to estimate the percentage of people that fall under the curve at each standard deviation. It is a rule of normal distribution that 68 per cent of the population falls between one standard deviation each side of the mid-point, and that 95 per cent of the population falls between two standard deviations either side of the mid-point. The standard deviation needs to be calculated on the raw scores to understand exactly what value is represented by these intervals.

For example, the standard deviation for obedience scores was 2.8 and the mean, median and mode score was 7. If 7 is placed at the mid-point, +1 standard deviation from the mid-point would be 9.8 and -1 standard deviation from the mid-point would be 4.2. This means that 68 per cent of our sample would achieve an obedience score of between 4.2 and 9.8, and that 95 per cent of our sample would achieve an obedience score of 2, with standard deviations from the mid-point of between 1.4 and 12.6.



### Skewed distribution

Some distributions are not normal, but are referred to as skewed because they are not symmetrical (see Figure 5.5). This may be a result of the test administered or the type of sample gathered. If a test is easy or the aptitude of the sample is unusually high, it will mean that most people score highly. This will lead to a negative skew, where many people score above the average or mean score; they would be bunched to the right with a tail on the left. If the test was particularly difficult or the aptitude of the sample low, it will mean that most people will achieve a low score. This will lead to a positive skew, which many bunched on the left and a tail on the right.



► Figure 5.5 Examples of skewed distributions

#### MATHS TIP

It is common to confuse positive and negative skews. Remember that a positive skew has its tail at the positive end of values on the horizontal axis (higher scores) and a negative skew has its tail at the negative end of values on the horizontal axis (lower scores). Another way to remember it is to draw a face on the graph so that it becomes a whale. A whale swimming towards the vertical axis is coming home, so it is positive, and a whale swimming away from the vertical axis is negative because it is leaving home.

When plotting the mean, median and mode on a distribution curve remember that the median will always be exactly in the middle of the x-axis and the mode will be where the most values sit (the highest frequency). If skewed, the mean will be towards the right if it is a positive skew, and towards the left if it is a negative skew.

The mean is affected by extreme scores, by the lower scores on a negative skew and by the higher scores on a positive skew. The mean will therefore be lower than the mode in a negative skew, but will be higher than the mode in a positive skew.

#### THINKING LIKE A PSYCHOLOGIST

Carry out a study of the height of your classmates.

Calculate the frequency, mean, median, mode, range and standard deviation of height data gathered and draw a frequency graph to check whether height is equally distributed among the class.

#### SKILLS

INTERPRETATION,  
COMMUNICATION

#### ACTIVITY 3

Draw a normal distribution curve, a positive skewed distribution curve and a negative skewed distribution curve. You can draw these freehand.

Now plot the mean, median and mode on each distribution curve.

#### RATIOS AND FRACTIONS

Both ratios and fractions are mathematical calculations to show how a part is related to a whole or other part.



**MATHS TIP**

Fractions can be easily converted to decimals by dividing the numerator by the denominator.

$\frac{1}{4} = 0.25$ . Decimals can be converted to percentages by multiplying by 100;  
 $0.25 \times 100 = 25$  per cent.

**KEY TERMS**

**deductive:** a theory has been established and then tested to see whether it can be supported by data

**inductive:** conclusions are drawn from the data to produce a theory

**thematic analysis:** recording themes, patterns or trends within data

A ratio is a calculation that shows a relationship between two quantities. In a part-to-whole ratio, one number represents the part of the quantity being compared and the other number represents the total quantity. For example, 5 : 10 shows that there are five parts out of a total of ten. Part-to-part ratios describe the proportions of each part. For example in a group of five people, 3 : 2 could represent a ratio of 3 girls to 2 boys. The values are separated by a colon. To calculate a part-to-part ratio, you need to identify the two values to be compared. For example, 100 people obeyed a command and 500 people did not obey a command = 100 : 500. This can be simplified to 1 : 5.

Fractions are a calculation that show a part of a whole. The numerator is the top value, and represents the part being counted, and the denominator is the bottom value, which represents the total value to which the whole is divided.

To represent values as a fraction, both the part and whole need to be identified. For example, if 100 people did not obey and 500 people did obey, that would be 100 out of a total 600 people.  $\frac{100}{600}$  can be simplified to  $\frac{1}{6}$ .

**ANALYSIS OF QUALITATIVE DATA USING THEMATIC ANALYSIS**

Qualitative data is non-numerical data often gathered through interviews, questionnaires, case studies and observations. Qualitative data can be converted into quantitative data by counting instances of an event occurring. **Thematic analysis** is a way of analysing a vast amount of qualitative data by reducing it into manageable general patterns, trends and themes, without losing its meaningfulness completely. Thematic analysis is achieved through reviewing and identifying themes in the qualitative data. This can be done inductively or deductively. Using an **inductive** approach, the researcher would read and reread the qualitative data gathered and themes would emerge from the data without the researcher imposing any of their own ideas or expectations from it. **Deductive** thematic analysis would involve the researcher specifying the themes that they will look for before analysing the data.

Thematic analysis is very flexible, and many researchers use it in different ways. The overall procedure involves carefully reading and considering the qualitative data gathered and identifying the themes present in the data that occur frequently, or seem to be a key feature of the data. How frequent or central to the text the theme is depends on the opinion of the researcher and the nature of the material analysed.

The researcher will develop these themes into 'codes', which represent the categories of themes found. The researcher will then use these codes to analyse the data gathered and search for instances where they appear in the data. This is reviewed continually, and changed if necessary, until the themes can be stated, supported and used as a summary of the data. Examples can be drawn from the data to support the themes identified.

Analysis of qualitative data using thematic analysis or other forms of qualitative analysis is often considered to be unreliable because the themes are highly dependent on the subjective opinions of the researcher, and therefore can lead to researcher bias. For example, if a researcher expected that people with an internal locus of control are more likely to report that they are not influenced by their peer group, they may have preconceived ideas that affect their analysis and the way interview transcripts are interpreted. This can be overcome by using an independent coder, or comparing the themes identified by different coders to establish interrater reliability.

Even though there is very little control over how a thematic analysis is conducted by individual researchers or how they have decided which themes to identify, qualitative analysis does yield far more detailed and meaningful information than quantitative data. It can also be useful to uncover opinions and beliefs about a topic, without reducing data to number values, so retaining its meaningfulness.



The BPS Code of Ethics and Conduct was updated in 2021 and can be found on the British Psychological Society website.

## ETHICAL GUIDELINES

Psychological research involves working with humans and animals, and certain codes of conduct are used to regulate this. These codes are referred to as ethical guidelines.

Research within the UK is regulated by the British Psychological Society (BPS). In America, the American Psychological Association has its own ethical code. The European Federation of Psychologists' Associations regulates Portugal, Spain, France, Italy, Malta and Greece using the Carta Ethica. Other countries have their own associations or societies that regulate ethics, and research is regulated by individual Institutional Review Boards at the universities where it is being conducted. These Institutional Review Boards (or Research Ethics Committees) often form networks with other universities.

The BPS Code of Ethics and Conduct (2009) will be discussed here, but most countries are regulated by a similar framework and have similar guidelines. The purpose of ethical guidelines is to ultimately ensure the safety and well-being of participants within psychological investigations. However, they are also used to ensure that the standards, professionalism and reputation of the subject are upheld.

The BPS ethical code is based around four ethical principles: respect, competence, responsibility and integrity (as updated in 2021).

### RESPECT

This principle expects psychologists to have a general respect for the dignity of all individuals in terms of their cultural and role differences (ethnicity, age, religion, race, etc.) and the experience they bring to the research. This respect should maintain the right to privacy and **confidentiality** for the safety of the individuals concerned. The principle also maintains that psychologists should seek to gain **informed consent** by disclosing the full nature of the research and avoid deception where possible. Participants of research should be offered a **right to withdraw** at any point and without consequence.

### COMPETENCE

This principle concerns the level of professionalism held by the psychologist conducting research. It maintains that a researcher should be fully aware of the ethical code and if they are uncertain whether their research proposal meets these principles, they are to seek help from experts or supervisors. Psychologists should monitor their own knowledge of the area and recognise their own limits and the limits of their research.

### RESPONSIBILITY

Psychologists not only have a responsibility to their participants, but also to the general public, the profession and to science. They must ensure that their research does not harm others, or result in misuse. They should consider the views of the participants and inform them of any potential for harm and how they will be protected from this harm. This principle reiterates the participants' right to withdraw and maintains that participation should be voluntary. If participants are compensated for their participation, the **incentive** should not be used to coerce participation. A debrief should always be given at the conclusion of research.

### INTEGRITY

Psychologists should be honest and fair in all of their work and avoid situations where they may be seen to exploit others. Psychologists should be mindful to not hold interests which may conflict with the interests of their participants. Psychologists should also consider how the research is likely to be received by the public or used by organisations.

## KEY TERMS

**confidentiality:** participants should not be identified as part of the study. Their data can be anonymised

**incentive:** a monetary reward or other form of gift given to encourage participation in the study

**informed consent:** participants should be fully aware of the aims, procedure and implications of the research they are agreeing to undertake

**right to withdraw:** participants should be offered the opportunity to leave the study at any point without consequence. This means that they can withdraw their data after the study if they choose (up to a negotiated point in time)



This code of ethical principles forms a framework that regulates research in psychology. However, it cannot address every possible situation that a researcher might face. Such judgements are made by the researcher, and consultation with other professionals in the field is encouraged.

### WIDER ISSUES AND DEBATES

#### The Ethical Code

The main elements of the ethical code can be structured in a brief form and can be used as a guide for your own practical investigations.

<b>Confidentiality:</b>	Are the participants anonymised so that they cannot be identified by name or any other personal information about them?
<b>Right to withdraw:</b>	Are participants aware that they can choose to leave at any point before, during or after the study, and that they can even have their results withdrawn from analysis up to a set period of time?
<b>Informed consent:</b>	Are participants fully aware of the study aims and nature of their participation before they agree to take part? Is any information being withheld?
<b>Protection of participants:</b>	Participants should not be subject to physical or psychological harm. Researchers should be mindful of how a participant might feel (stressed, embarrassed, fearful) and avoid such situations.
<b>Privacy:</b>	Participants should not be involved in research that gathers personal or private information that they would not willingly disclose.
<b>Deception:</b>	Are the participants lied to about the nature of the study?
<b>Debrief:</b>	Participants will need to be told the nature of their participation when the study has concluded. If deception has been used or information withheld, it must be fully disclosed during a debrief.

Social psychological research can pose significant ethical issues because of the nature of the topics being investigated. Obedience research, for example, is deliberately presenting naïve participants with the commands of an authority figure, often insisting that we perform a behaviour that we would not ordinarily choose to do. Conformity research places participants in a situation where they are pressured to go along with a majority, which can cause tension and distress. As such, ethical problems need to be eased by using procedures such as debriefing participants fully immediately after the investigation, screening out particularly vulnerable individuals, anonymising participants and taking measures to minimise distress.

### SKILLS

#### ETHICS, ANALYSIS

### ACTIVITY 4

In Topic A: Social psychology you will learn about one classic and two contemporary studies. Review one of these studies and compare it to the BPS ethical guidelines. This will give you an overview of the ethical issues present in research in social psychology.



**RISK MANAGEMENT WHEN CONDUCTING PSYCHOLOGICAL RESEARCH**

Risk management is important when organising any activity, so is particularly important when designing a psychological investigation which may involve physical or psychological harm. Risk management is a process whereby risks are initially identified, and then the nature, likelihood and severity of risk is predicted. Finally measures are put into place to minimise or remove the potential risk.

Before Milgram conducted his obedience research, he sought to identify risk by asking psychiatrists whether they thought anyone would deliver the highest shocks. The psychiatrists predicted that most participants would not go beyond 150 volts. This suggests that Milgram was considering risk to participants by trying to identify whether distress would be caused by being ordered to deliver harmful electric shocks. As 65 per cent of participants did administer 450-volt shocks, it shows how difficult it can be to predict risk of harm.

**Identifying risk**

The BPS describe a range of possible risks to participants involved in psychological research. Participants may be at risk of their self-esteem being affected by engaging in psychological research which causes embarrassment or ridicule. Research can also affect personal values, relationships, privacy and can involve personal information being disclosed. This is particularly important when researching vulnerable groups, such as children, those lacking the ability to give informed consent, and those with mental health problems or traumatic past experiences.

Risk can also be associated with certain types of research, such as socially sensitive research (research into ethnicity, political or religious beliefs). Risk can also be associated with research which involves deception, as the true nature of the investigation is withheld from participants, who then cannot make an informed decision to take part. Some research can involve psychological stress or prolonged testing, or even invasive or extreme procedures such as excessive exercise or administering medication or taking blood samples.

A researcher must fully consider all aspects of their design, procedure, sample and how the results are likely to be used, to identify potential risks. The BPS suggest a five-stage process in risk management:

1. Identification of possible risks.
2. Establishing what the risks are and who is likely to be affected.
3. Evaluating the severity and likelihood of the risks and how they can be managed.
4. Documenting the risk assessment.
5. Assessing the effectiveness of the risk assessment and modifying control measures if necessary.

As such, risk assessment is an ongoing process, as risks can change and new measures to control risks can be implemented.

**SKILLS****ETHICS, INITIATIVE****ACTIVITY 5**

Try identifying the possible risks associated with research that you have learned in this topic. Conduct your own risk assessment and suggest possible control measures that can be employed.

**CHECKPOINT**

- Identify the descriptive statistic being defined:
  - The most frequent score is observed in a data set
  - The middle value of a data set
  - The spread of scores calculated by subtracting the highest score from the lowest score
  - The arithmetic average calculated by totalling the scores in a data set and dividing this by the number of values
  - The mean of deviations from the arithmetic mean in a data set
- Match the ethical code to its definition.

Definition
1. Informed consent
2. Privacy
3. Confidentiality
4. Right to withdraw
5. Protection of participants
6. Debrief

Ethical code
a) Participants data is anonymised so they cannot be identified
b) Participants are aware that they can leave at any point
c) Participants know exactly what they are agreeing to take part in
d) Participants are not subjected to psychological or physical harm
e) Participants are told the nature of the study when it has concluded
f) Participants are not asked to disclose information which they would normally not disclose

**SKILLS**

COMMUNICATION, CRITICAL  
THINKING, PROBLEM SOLVING

**EXAM PRACTICE**

- Rong-jun was investigating the obedience of students at a school. She wanted to find out if obedience levels changed depending on the status of authority of a teacher. She sampled a total of 300 students across the whole school. She found that 92 per cent of the students sampled said they would obey a senior teacher even if they disagreed with the senior teacher's command. Calculate the number of students who said they would obey the senior teacher. (1 mark)
- A total of 30 students in Rong-jun's sample said that they would follow the instructions of another student even if they disagreed with them. The other students said that they would not. Calculate the ratio of students who would follow the instructions of another student even if they disagreed with them. (1 mark)
- Rong-jun asked the students to rate their level of obedience on a scale of 1 (very disobedient) to 10 (very obedient). She calculated the mean obedience rating. Explain one reason why Rong-jun calculated the mean rating rather than the mode score. (2 marks)
- Explain why Rong-jun calculated the standard deviation of the obedience ratings rather than using the range. (2 marks)



# CHAPTER 6 STUDIES

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- describe and evaluate one classic study by Moscovici et al. (1969) Influence of a consistent minority on the responses of a majority in a colour perception task
- describe and evaluate one contemporary study by Burger (2009) Replicating Milgram: Would people still obey today?
- describe and evaluate a contemporary study by Haun et al. (2014) Children conform to the behaviour of peers; other great apes stick with what they know.

## GETTING STARTED

Investigate whether people are persuaded by the responses of others. Select two different sources, such as two different soft drinks, two different popular television programmes or two different popular songs. Put an image of each source on paper and beneath each source place a percentage that is high for one source and low for the other source. Now show the paper (with the different sources and percentages) to another student and ask them to pick their favourite. Have the percentages persuaded them to pick a particular source?

## MOSCOVICI ET AL. (1969) INFLUENCE OF A CONSISTENT MINORITY ON THE RESPONSES OF A MAJORITY IN A COLOUR PERCEPTION TASK

### AIM

Serge Moscovici et al. (1969) conducted a series of experiments to investigate minority influence on a majority when given a colour perception task in a group. This was to investigate whether social pressure exerted by a minority would be able to influence a majority into giving an incorrect response.

They also wanted to investigate whether a consistent minority would exert a greater influence than an inconsistent minority.

They aimed to investigate whether the minority influence created only a change in verbal response or also an actual change in perception.

### SAMPLE

All participants were female liberal arts, law or social science students placed in groups of six; two of the group were confederates of the study and four were naïve participants. Female participants were chosen because the researchers thought they would have a greater involvement in evaluating colour.

▼ Will colour perception change due to peer pressure?



### PROCEDURE

Each group were seated in a row in front of a screen and told that it was a study of colour perception. They were also informed that they would be asked to judge the colour and variation in light intensity of a series of slides, and given a brief explanation of what was meant by light intensity. All group members were given a test to check for visual abnormalities and to demonstrate to the participants that all group members had normal vision. This was an important control to remove the possibility that naïve participants would attribute different colour judgements due to visual differences.



The apparatus included a screen, upon which a series of blue coloured slides were projected using coloured filters. Participants were asked to say aloud the colour of the slide and judge light intensity on a scale of 0–5 (0 being dimmest and 5 being brightest). There were six slides, which were presented six times each, for 15 seconds per slide. Each participant therefore saw and judged the colour and light intensity of 36 slides in total. After a practice trial, each slide was presented one at a time and the two confederates consistently reported that the slides were green in colour.

There were two variations of this procedure:

- In the first variation, for 12 of the groups, the confederates were seated next to each other and gave the first and second responses of the group. For the other 20 groups, the confederates gave the first and fourth response. This was aimed at making the second confederate appear independent of the first.
- In a second variation of this procedure, 13 groups experienced an interruption of one-minute pauses after slides 12 and 24. In these groups the confederates gave their response first and fourth in the group. This interruption was aimed to test the impact of commitment to their first response and allow a possible change in response.

At the end of the experiment the participants were given a post-experimental questionnaire.

In a second experiment, ten groups of participants completed the first experiment and were then asked to consent to taking part in another researcher's study on the effect of exercise on visual phenomena. The researcher gained agreement and then left the room and immediately another researcher entered and repeated the request. Participants were seated around a table and the researcher explained that it was an experiment on the effect of exercise on visual phenomena. The participants were isolated by cardboard screens and instructed to privately judge the colour of the slides by writing them down on a piece of paper. In this experiment, three of the slides were blue and three green, but ten were ambiguous. Each of the 16 discs were presented one at a time for five seconds on a neutral background in the centre of the table.

After the experiment, the first experimenter returned to end the experiment and administer the post-experimental questionnaire. This second experiment was designed to see if experiment one had a lasting effect on perception for those who yielded to the minority, and to see if participants who did not publicly yield to the minority in experiment one, perhaps because they repressed their response during the social interaction, would have at least changed their **perceptual code**.

In a third experiment, 11 groups were tested to see if the degree of consistency between the confederates had an impact on minority influence. In this experiment the confederates said that the colour of the slide was green 24 times and blue 12 times, therefore demonstrating inconsistency in their judgement.

A control group of 22 participants also made colour judgements in groups of six with no confederates present. There was a control group for each of the experiments conducted.

### KEY TERM

**perceptual code:** a way of perceiving or interpreting information. In the context of Moscovici's experiments, when a minority consistently presents a viewpoint, it can challenge the majority's perceptual code.

### SKILLS

CRITICAL THINKING, ANALYSIS, INTERPRETATION, ETHICS

### ACTIVITY 1

Identify the ethical issues with Moscovici et al.'s procedure. Consider whether these ethical issues could have been avoided.

### RESULTS

Moscovici et al. measured minority influence by the number of 'green' responses given by the naïve participants. They found that green responses were given for 8.42 per cent of answers in the first two experiments ( $n = 128$ ) compared to 0.25 per cent of green responses given by the



22 participants in the control group. This demonstrated that the control group perceived the slides as blue. As such, the green responses given by the naïve majority can only be explained by minority influence. They showed that 32 per cent of naïve subjects conformed to the minority colour judgement by saying that the blue slide was green on at least one occasion.

There were groups who were not influenced by the minority, and groups who were influenced, and in groups which yielded to minority influence, 57 per cent of the naïve participants (an average of two participants per group) gave the same response as the confederates. There was no difference between responses given by participants exposed to a minority in first and second position, or first and fourth. They did find that minority influence was greatest when the light intensity of the slide was weak, but irrespective of this the green response was higher in the experimental groups than the control groups.

In the second experiment, Moscovici was testing whether those who were and were not influenced by the minority (did or did not change their public response) in experiment one, would or would not change their interpretation of the colour slides in the second phase. They observed that those participants who did not publicly agree with the minority during the first experiment were more likely to shift their judgement in phase two than those who did publicly agree in experiment one. This suggested a modification in perceptual code in these participants, more than a change of verbal response in experiment one.

In the third experiment, where the minority was not consistent in their colour response, only 1.25 per cent of responses were in agreement with the minority. This suggests that consistency of the minority is an important behaviour style.

Overall, this suggests that minorities can exert some, albeit small, influence in a laboratory situation using female participants, particularly if the minority are consistent in their viewpoint. The experimental data also suggests that a consistent minority can modify the perceptual code or norm of a majority. Interestingly, post-experimental interviews found that those who tended to agree with the minority perceived the slides as having a range of green-blue shades compared to those who did not agree with the minority, who claimed the slides were simply blue. This perhaps suggests that members of the majority were genuinely making an effort to consider the viewpoint of the minority. This could be because the minority were exerting informational social influence.

Overall, it seems that a consistent minority is more capable of modifying a majority's perceptive code than their social response. This contrasts with majority influence which would be more likely to influence a social response than affect a perceptual code.

### **EVALUATION OF MOSCOVICI ET AL. (1969)**

One issue with Moscovici's minority research was that only female liberal arts, law and social sciences students were used in the investigation, so the findings may not represent the behaviour of males or non-students in minority influence situations. This would limit the findings about conformity to a minority of a female student population only. It was also only conducted with American students, and we know from cross-cultural research that there is considerable variation in social influence in different countries.

A strength of Moscovici's research was that it was conducted using a highly standardised procedure with variables tightly controlled. One control was that all participants were given a test to check for visual abnormalities, so that anyone with visual problems could be removed from the study. This also ensured that participants knew that everyone in the group had good colour vision, which avoided naïve participants considering the judgements of the minority as incorrect because of visual issues. The participants were also randomly allocated to an experimental group or control group, which removed the possible bias of certain types of personality being grouped together. He also controlled for the intensity of light affecting visual perception by altering and analysing different light intensities of the slides and participants'

responses. These controlled variables mean that the study can be replicated to check whether minority influence is a consistent outcome.

However, a laboratory environment is artificial and may not reflect how minority groups exert their influence in real-life situations over real issues. This means that the study has low ecological validity and therefore we cannot be sure that minorities will exert the same influence over people in real situations.

#### EXAM TIP

You may be asked to suggest an improvement to research listed on the specification. You must suggest a suitable improvement that will actually improve the study. This can be identified by considering the weaknesses of a study. You must also justify why your suggested improvement will improve the study.

Example:

One improvement to Moscovici's research would be to use male and female participants as Moscovici only used female students. This would be a more representative sample so that we can be sure the minority influence over a majority would extend to the wider population and increase generalisability.

#### REPLICATING MILGRAM: WOULD PEOPLE STILL OBEY TODAY? (BURGER, 2009)

In 2009, Jerry Burger decided to replicate Milgram's (1963) study in contemporary society. He too was interested in whether people would obey an authoritative figure. Some psychologists today believe that people are more aware of the consequences of unthinkingly following orders from an authoritative figure and, as a result, would reconsider their actions when asked to cause potential injury to others. However, Burger believed that despite the large time gap between his study and Milgram's, his study would still produce similar levels of obedience. Burger felt that, although society's culture and values had changed, this would not have a significant effect on obedience.

Burger was also very mindful that Milgram's obedience study had been subject to ethical criticism, and so he needed to adapt his research to adhere more closely to the current ethical guidelines and cause minimal participant distress.

#### EXAM TIP

For any named study on the specification, you should know the aim(s), sample, procedure, results and conclusion(s), as you could be asked to recall specific information on these elements.

Aim to recall at least one point per mark that might be awarded in the exam, using the following guide (e.g. try to remember two aspects about the sample):

- Aim(s) – 2 marks per aim
- Sample – 2 marks
- Procedure – up to 5 marks
- Results – up to 4 marks
- Conclusion(s) – 2 marks per conclusion



**AIM**

To investigate obedience by partially replicating Milgram's (1963) study to examine whether obedience to an authoritative figure would still be present today.

**SAMPLE**

Individuals responded to adverts and flyers in a local newspaper and local establishments (library, businesses) as well as online. The adverts promised US\$50 for taking part in two 45-minute sessions. Individuals expressed their interest by phone or by email. Individuals then received a call from a research assistant who began a screening procedure. Participants were asked if they had been to college and if they answered yes, they were also asked if they took psychology lessons. The purpose of such questions was to reject individuals who had taken two or more psychology classes in order to exclude those who may have been familiar with Milgram's original study. The remaining participants were asked about their physical and psychological health and whether they had suffered any traumatic childhood experiences. A further 30 per cent of participants were excluded from further involvement in the study after this. This first screening process eliminated any participants with knowledge of Milgram's study or who may have obvious issues with taking part.

Participants then continued onto the second screening process led by two clinical psychologists and held at Santa Clara University campus. This screening process required the individuals to complete a number of scales/questionnaires; a demographic sheet asking about age, occupation, education and ethnicity; the Interpersonal Reactivity Index; the Beck Anxiety Inventory; the Desirability of Control Scale; and the Beck Depression Inventory (see Table 6.1).

TABLE 6.1: QUESTIONNAIRES USED BY THE STUDY

Questionnaire	Number of items	Details
Interpersonal Reactivity Index	28-item scale	Designed to analyse empathy levels
Beck Anxiety Inventory	21-item scale	Allows individuals to rate their own anxiety levels against 21 different anxiety symptoms
Desirability of Control Scale	20-item scale	Measures the individual's impressions of themselves in terms of self-control of their lives
Beck Depression Inventory	21-item scale	Designed to assess the measure of severity of depression in an individual

Participants were then taken to a room and interviewed by a clinical psychologist to assess those who might be negatively affected by the study. The interview was structured around the Mini International Neuropsychiatric Interview (MINI) procedure. The MINI interview touches on psychological disorders and allowed the psychologist to identify anyone who should not be part of the study. Each interview lasted approximately 30 minutes. In total, 123 individuals took part in the second screening and 47 (38.2 per cent) were removed from continuing with the study but allowed to gain their money as advertised. Their exclusions and reasons behind their exclusion are unknown due to confidentiality agreements.

A total of 76 individuals were invited back a week later but 6 dropped out at this point, 5 of whom expressed awareness of Milgram's research during the second session, leaving a final sample of 29 males and 41 females. They ranged in age from 20 to 81 years old, with a mean of 42.9 years.

## PROCEDURE

Participants were randomly split into two groups with an attempt to keep equal ratios of gender in each group. Forty participants were randomly assigned to the baseline condition and 30 participants to the model refusal condition.

### Baseline condition

Each participant was introduced to the experimenter and the confederate before starting. Both the experimenter and confederate were selected due to their resemblance to those used in Milgram's study. It was at this point the participant and confederate were both given US\$50 and told to keep it even if they chose to withdraw from the study. Burger used a similar script to Milgram's original and explained the procedure of the study to the participant and the use of the electric generator. The role choice was also rigged, similar to Milgram's study, and the confederate always received the role of learner and the participant the teacher. They were both then asked to sign the consent forms.

Exactly like Milgram's study, the learner was put into the adjoining room while the teacher was placed before an electric generator. The teacher was asked to join the experimenter while he prepared the learner for the study. The participant witnessed the experimenter placing an electrode onto the learner's left wrist, sealing it with paste and explaining that it would 'provide a good contact to prevent blisters or burns'.

Burger followed Milgram's procedure and asked the teacher to read out a list of 25 word pairs. The teacher was told that if the learner failed to remember the word pair after being given the first in the pair correctly, an electric shock should be administered using the electric generator in front of them. Each wrong answer would result in a stronger shock being administered. At this point, the confederate revealed a problem with his heart that was detected at a hospital visit.

The learner was shown how to use the electric shock generator and given a 15-volt sample shock. The same four verbal prods from Milgram's study were used in Burger's study and pre-recorded voice feedback grunts from the learner were audible from the 75-volt shock level. At 150 volts, there was a standard recording of the learner's voice demanding to be released and complaining of heart issues.

At this point, and after the experimenter used the verbal prods, if the teacher was resistant to continuing, the experiment was ended. The experiment was also forcibly ended at the point where the teacher read out the next instruction following the administering of the 150-volt shock. On finishing the experiment, the experimenter immediately admitted to the teacher that the shocks were not real, and the teacher was introduced to the learner to ensure they knew that he was perfectly fine.

### Modelled refusal condition

In this variation, all participants followed the same procedure as the baseline condition but with a few minor exceptions. Two confederates were used instead of one. The second confederate posed as a participant and was the same gender as the real participant. Again, the drawing of roles was rigged and resulted in a learner (confederate), Teacher 1 (a confederate of the study) and Teacher 2, who was a real participant. Teacher 1 took the lead and began the procedure asking the questions and administering shocks while Teacher 2 sat with him/her. At 75 volts, and as scripted, Teacher 1 hesitated after hearing the learner grunt, and at 90 volts Teacher 1 stated 'I don't know about this'. Teacher 1 was prompted by the experimenter, but refused to carry on and pushed his/her chair back from the table. The experimenter would then ask Teacher 2, the real participant, to continue.



## RESULTS

In the baseline condition, 70 per cent of participants had to be stopped before attempting to continue past 150 volts; a rate that is just lower than Milgram's 82.5 per cent found in his variation experiment 5.

In the modelled refusal condition, 63.3 per cent went to continue the procedure after 150 volts despite expectations held by Burger and the confederate who withdrew. The results were very similar to the baseline condition.

There was little difference in obedience levels between genders in both conditions – 66.7 per cent of men and 72.7 per cent of women pressed the 150-volt switch in the baseline condition. The point at which male and female participants needed the first prod was also similar. Burger then compared the results shown in Table 6.2 with the screening tests of the participants relating to issues of empathy and control. He found little difference between those who stopped and those who continued and their corresponding empathy and control scores. He did find, however, that those who showed reluctance to give the shocks early in the procedure scored higher on desirability for control in the baseline condition. No difference was found when comparing the modelled refusal condition and base condition to personality scores.

TABLE 6.2: RESULTS FROM BURGER'S OBEDIENCE INVESTIGATION

Number (%) of participants who stopped	Male	Female	Total	Milgram's experiment 5
<b>Baseline condition</b>				
Stopped at 150 volts or earlier	6 (33.3)	6 (27.3)	12 (30)	7 (17.5)
Went to continue after 150 volts	12 (66.7)	16 (72.7)	28 (70.0)	33 (82.5)
<b>Modelled refusal condition</b>				
Stopped at 150 volts or earlier	5 (45.5)	6 (31.6)	11 (36.7)	
Went to continue after 150 volts	6 (54.5)	13 (68.4)	19 (63.3)	

## CONCLUSION

Results found in both conditions are similar to those found in Milgram's research over 45 years ago. Time and changes in society's culture did not have an effect on obedience levels nor did the refusal of the confederate.

Witnessing another person refuse to continue had no effect on obedience levels found, so it seems that the power of the situation had a greater effect. No difference was found between genders, nor did age, education level or ethnicity have an effect on obedience levels found.

There was some impact of personality on the reactions of participants, where those with high empathetic concern expressed a reluctance to continue early in the procedure, however this did not ultimately affect their obedience.

## SKILLS

CRITICAL THINKING, ANALYSIS,  
INTERPRETATION, ETHICS

## ACTIVITY 2

Using this description of Burger's experiment and Milgram's experiments on pages 7–13, compare the procedure, ethics and results/conclusions of both studies. It may be helpful to create a table to show the similarities and differences:

	Milgram's original experiment	Burger's experiment
Experiment procedure		
Ethical issues/controls		
Results/conclusions		

Colour code the differences and similarities.

## EXAM TIP

When revising evaluation of studies named on the specification, make sure that you can distinguish between the evaluation points in terms of validity, reliability, objectivity/subjectivity, generalisability and credibility.

## EVALUATION OF BURGER (2009)

Burger acknowledged the ethical concerns associated with Milgram's original experiments and took several measures to ensure the well-being of the participants in his research. The screening process was rigorous to ensure that participants deemed unsuitable for the study were not selected. Participants were informed three times before the experiment that they could leave the study without consequence, to make certain that they understood they had a right to withdraw. Other ethical considerations were also made: participants were only given a 15-volt sample shock rather than the 45 volts given to participants in Milgram's study. The experimenter in the study was a clinical psychologist instructed to stop the experiment if they detected excessive stress during the procedure. Additionally, the participants were immediately debriefed following the experiment to alleviate any distress or anxiety caused.

Despite these ethical considerations, it still should be considered that the participants involved were deliberately placed in a situation that would cause anxiety, and the verbal prods used by the experimenter could have been understood to remove any previously established right to withdraw, even if only temporarily.

Burger only partially replicated Milgram's study because he did not allow participants to go beyond the 150-volt level due to the ethical concern that they would experience greater amounts of distress beyond this point, as observed in Milgram's study. This is an ethical strength of the study, but it can only be assumed that the participants would have continued to obey after 150 volts, as the experiment was stopped at this point. This assumption was based on the fact that the majority of Milgram's participants continued once they had reached this seemingly 'point of no return'. However, we cannot be certain that the participants involved in Burger's study would have continued.

Burger tested males and females and participants who had different levels of education and varied ethnicity. Therefore the study had population validity so the conclusions drawn about obedience to authority can be generalised to the US population. However, 47 participants were not selected following the screening process as they would have found the procedure too distressing, which might indicate that the obedience levels found would only apply to people without psychological issues, such as anxiety or depression. This may limit the generalisability of the findings.

One strength of Burger's research is that he used standardised procedures so that all participants were read the same instructions and given the same verbal prods to continue shocking the learner. This means that Burger's research can be retested exactly to ensure that the 70 per cent obedience level he found would be consistent. Burger found a similar obedience level to the comparison Milgram variation (experiment 5), which suggests that obedience is consistently observed among participants in the same situation.



Burger used the 150 voltage at which participants broke off or continued as a measure of obedience. This measure could be regarded as objective because it is not open to interpretation by other researchers.

One weakness of Burger's obedience study is that it was conducted in a laboratory at Santa Clara University. This is an artificial setting to investigate obedience as it does not represent a real-life setting like at home or in school or the workplace. Therefore, the 70 per cent obedience level found by Burger may not be found in an ordinary setting. Laboratory research demanding obedience to shock another person based on a word-pair associate task is unlike real-life obedience, which can be a very ordinary experience (complying with the request of a teacher or parent), therefore the task lacks mundane realism.

### HAUN ET AL. (2014) CHILDREN CONFORM TO THE BEHAVIOUR OF PEERS; OTHER GREAT APES STICK WITH WHAT THEY KNOW



▲ Orangutans are primates who have many similarities to humans



▲ The children who took part in the study were around two years of age

Haun et al. investigated conformity between human and non-human peers to see whether social conformity was specific to humans. In this investigation, primates were used because they are the most similar animal to humans.

#### AIM

To investigate human and non-human animals' tendencies to adjust their behaviour to a majority of their peers in a similar situation. Specifically to investigate whether two-year-old children and primates (chimpanzees and orangutans) would adjust an individually acquired behaviour strategy following exposure to a majority of peers displaying an equally effective but different behaviour strategy.

#### SAMPLE

The sample consisted of 18 two-year-old children (nine male and nine female) with a mean age of 28 months, 12 chimpanzees (seven female and five male) with a mean age of 121 months, and 12 orangutans (six male and six female) with a mean age of 102 months.

#### PROCEDURE

The experimental procedure consisted of a box with three sections of a different colour, arranged horizontally (the two outer sections were of equal height and the third section in the middle was shorter). Each section top had a hole in it. The box was placed on the ground for the child participants, but in the case of the primates the box was attached to the outside of a steel mesh of an observation room.

When a ball was placed into one of the holes on the top of a section it would trigger a reward being dispensed at the bottom of that section. The researchers controlled which holes had an active trigger to release the reward. The rewards were peanuts for primates and chocolate drops for children.

During an initial phase, all participants learned that a ball would go into any hole, but that only one would dispense a reward. Participants were allowed to drop a ball into any section until they learned that only one colour section would dispense a reward. Learning was measured as dropping a ball into the correct section eight out of ten times. Participants were then taken two metres away from the box where they were able to watch three familiar **conspecific** peers interact with the box

#### KEY TERM

**conspecific:** a member of one's own species



one at a time, seeing them place the ball in a hole and the section dispense a reward. The conspecific peers were labelled as demonstrators. The demonstrators were trained to prefer one colour section of the box, which was different from the section which the participant had learned dispensed the reward. The first demonstrator placed the ball in the section hole and received a reward. The demonstrator did this twice. The procedure was repeated for the remaining two demonstrators to produce a majority.

The ball was handed to a demonstrator only when the participant was looking, and the trial was repeated if the participant wasn't paying attention while the ball was dropped, or reward dispensed.

After six demonstrations, the demonstrators were led away but were still able to see the participant interacting with the box. After 30 seconds, the participants were given three balls, one at a time, and allowed to place each ball in a section hole of their choice. All three choices were rewarded regardless of the hole they chose. The choice of hole selected by participants was video recorded and coded by two independent observers as one of three responses:

- A switch to the majority response
- Staying with their own preference (what they had previously learned)
- Choosing a third option which was not their preferred or demonstrated response.

## RESULTS

The number of 'stay' responses were subtracted from the number of 'switch' responses to calculate whether the participants conformed to their majority peer. A score of  $-3$  indicated that they chose their preferred response, whereas a score of  $+3$  indicated that they changed their response to match the peer majority. So negative scores demonstrated no conformity, and positive scores demonstrated conformity.

Table 6.3 shows that children, but not primates, are more likely to change from an initial preferred strategy to that of their peers. Further analysis showed that children conformed to their peer group in over half of trials, whereas the primate participants almost exclusively stayed with their preferred choice and did not conform to the peer majority.

TABLE 6.3: THE NUMBER OF PARTICIPANTS WHO CHOSE 'STAY', 'SWITCH' OR 'OTHER RESPONSE'

	Switch	Stay	Other response
Children ( $n = 18$ )	12	6	0
Chimpanzees ( $n = 12$ )	2	10	0
Orangutans ( $n = 12$ )	2	8	2

## CONCLUSION

The researchers concluded that in a situation where children, chimpanzees and orangutans observe a conspecific peer majority perform a behavioural strategy different from one they have learned, it was children who were more likely to adjust their behavioural strategy than primates.

### THINKING LIKE A PSYCHOLOGIST

Imagine that you have been tasked with promoting a uniform code at your school. Using Haun et al.'s research, consider ways that you would encourage students to adhere to the correct school uniform.



**EVALUATION OF HAUN ET AL. (2014)**

One weakness of this research is that the way in which conformity was tested was using an artificial task. It is not a typical everyday task to watch a conspecific place a ball in a hole and receive a reward, so the levels of behaviour change recorded were only demonstrated under contrived conditions, which may not reflect how we conform to peers in more everyday situations, such as in the playground. However, conformity to their peers was objectively measured as 'switch', 'stay' or 'other response'.

Also the study used captive primates, so their behaviour may not usefully reflect that of wild chimpanzees and orangutans. We have also learned previously that there is considerable variation in conformity between individuals which may have influenced the findings of this research. As such, the findings of this research may not generalise beyond the sample tested. We also cannot be certain from this study that the influence of the peers had any lasting effect on behaviour change, as this was not tested.

However, Haun et al. used highly standardised procedures and controls to ensure that all children and primates took part in the study in exactly the same way. This means that the behaviour adjustments recorded can be retested, and we can be sure that the changes in behaviour were a direct result of observing a peer demonstrating an alternative behaviour strategy. Also, the peer was known to the participant, so the findings reflect conformity to someone familiar and not a stranger.

One important application of this research is that it can be used to promote positive behaviour change in others. Knowing that our peers are a source of social influence that mediates behaviour change can be used to encourage compliant behaviours, and even specific behaviour change such as using peers to pick up litter or turn off electrical appliances. If we know that we are consuming more electricity than our neighbours, it may influence household owners to reduce energy consumption themselves.

**CHECKPOINT**

1. Identify which classic or contemporary study used each of the following samples:
  - a) Female students who were studying Liberal Arts, Law or Social Science
  - b) 18 two-year-old children, 12 chimpanzees and 12 orangutans
  - c) 70 participants who responded to an advert in a local newspaper or local establishment. 29 were male and 41 were female
2. You will have learnt about a study by Haun et al. (2014) Children conform to the behaviour of peers; other great apes stick with what they know.  
Describe the aim of the contemporary study in Social Psychology.
3. Explain one weakness of Moscovici et al's. (1969) study.
4. Describe one finding of Burger's (2009) study into obedience.

**EXAM TIP**

You have learned about two compulsory studies and one option study. This means that you can be asked for specific details of Moscovici et al. (1969) and Burger (2009) studies, but only general questions about your option study.

General questions can include describing the aim, sample, procedure, results and conclusions. You can also be asked for strengths, weaknesses and improvements. You may also be asked these general questions about the compulsory study but you should be aware that they could ask for more specific information.

When revising, you should separate each study into the aim(s), sample, procedure, results and conclusion(s). If you are asked to describe the procedure, you will not get marks for describing the aim(s), sample, results or conclusion(s).

**SKILLS**

ANALYSIS, COMMUNICATION,  
CRITICAL THINKING

**EXAM PRACTICE**

1. In social psychology, you will have learned about the following contemporary study in detail:

- Haun et al. (2014) Children conform to the behaviour of peers; other great apes stick with what they know.

Describe the procedure used in this study. (3 marks)

2. In social psychology, you will have learned about one classic study in detail:

- Moscovici et al. (1969) Influence of a consistent minority on the responses of a majority in a colour perception task.

a) State two results of Moscovici et al.'s (1969) study. (2 marks)

b) Suggest one improvement that could be made to Moscovici et al.'s (1969) study. (2 marks)

3. In your studies of social psychology, you will have learned about the following contemporary study in detail:

- Burger (2009) Replicating Milgram: Would people still obey today?

Describe how Burger (2009) screened the participants before they took part in his study. (2 marks)



# CHAPTER 7 PRACTICAL INVESTIGATION

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- design and conduct a questionnaire to gather both quantitative and qualitative data on a topic in social psychology
- plan and construct your questionnaire, including making sampling decisions and considering ethical issues
- collect and present your data using appropriate tables, graphs and descriptive statistics
- conduct a thematic analysis on your qualitative data and draw conclusions
- describe the strengths and weaknesses of your questionnaire
- use reporting conventions to document your procedure, results and discussion.

## GETTING STARTED

For this practical investigation you will be asking participants questions about a topic you have studied in social psychology. This should be about obedience, conformity or minority influence. In pairs read back through the relevant chapter and create questions that relate to whether someone would be obedient to authority, conform to a group or be influenced by a minority. You can be creative in your question styles: some questions can have fixed choice answers or be open ended, such as 'Have you ever disobeyed a teacher? Yes/No' and 'Describe a situation where you have disobeyed someone in authority'. Also consider creating statements that require a rating of agreement on a scale. For example 'If you are asked by a security guard to avoid leaning on the railing around an exhibit, how likely are you to obey them?' 1 – Not at all, 2 – Probably, 3 – I would obey.

You have learned about various experiments in social psychology, but as you know, these experiments are ethically not permissible to replicate because they cause anxiety or embarrassment. Instead, you must conduct a study using a questionnaire that investigates a topic that you have studied to ask for people's opinions and beliefs about their own or others' behaviour. For this example practical investigation, we will be using a questionnaire to gather information about gender and obedience, specifically whether men or women are viewed as more obedient by others. You may wish to conduct your own practical investigation on a different topic in social psychology or adapt this title to investigate how males and females perceive their own obedience.

Before you begin planning your practical investigation, you should review the methodology section in this topic to familiarise yourself with key terms and concepts concerning questionnaires. This will help you with the following design decisions.

Questionnaires must be carefully designed if they are to gather useful data ►





**AIM**

An aim is a general area of interest that the questionnaire is concerned with. In this practical example, the aim of the study is to investigate perceptions of gender differences in obedience. Aims tend to be based on previous research in the area, so this aim is derived from the fact that obedience research tends to predict that there is no difference in actual levels of obedience between males and females, but that females are more likely to be distressed when they have to comply with orders that they would not voluntarily choose to do.

Before you decide on your study aim, it is important to do a review of the background theory and research into the topic so that your aim is well founded.

**ALTERNATIVE HYPOTHESES**

Your practical investigation should have an alternative hypothesis. This is a prediction of what is likely to be found by your investigation based on what has been found in previous studies. Your alternative hypothesis may predict the direction of difference that is likely to be found, in which case it is known as a **directional (one-tailed) hypothesis**. However, if the previous research is mixed or unclear, it may not be possible to predict the direction of difference that you will find, therefore you will need to write a non-directional hypothesis.

In this study, a non-directional hypothesis will be proposed. *There will be a difference in perceived levels of obedience between men and women.* This is non-directional because, although experimental research suggests that males are not more or less obedient than females, social norms dictate that females will be either more compliant because they are considered to be less assertive than men, or less compliant because they do not want to cause harm to another. This means that perceived levels of obedience could be higher or lower for females compared to males.

However, if the study was interested in understanding the emotional responses to obedience experienced by males and females, a directional example would be more likely. For example: *Females will be perceived to be more distressed than males if they are ordered to harm another person.* This hypothesis is directional because both experimental evidence and social norms would predict that females will experience greater distress at harming another at the orders of an authority figure.

**KEY TERM**

**directional (one-tailed) hypothesis:** a directional hypothesis predicts the direction of difference or relationship that the result is likely to take

**SKILLS**

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

**ACTIVITY 1**

Write the aim of your investigation clearly. You might find it useful to begin with 'An investigation into...'

Write an alternative hypothesis. To decide whether your alternative hypothesis is directional (one-tailed) or non-directional (two-tailed) you should consider previous research and the theory you are testing. If the theory/research predicts that a specific outcome can be expected, you should use a directional (one-tailed) hypothesis. You should also make sure that the independent and dependent variables are included and operationalised.

**LINK**

The use of directional and non-directional hypotheses can also be found in Topic B: Cognitive psychology (see Chapter 11).

**QUANTITATIVE AND QUALITATIVE DATA**

For this practical investigation both quantitative and qualitative data collection will be centred around the first hypothesis, which states that there will be a difference in perceived levels of obedience in males and females.



### Quantitative data

The first half of the questionnaire will consist of a series of closed questions related to perceptions of male and female obedience. Scores will be totalled so that each participant has a rating of perceived obedience for men and women. Some examples of closed questions include:

1. If a police officer asked a passer-by to pick up litter, who do you think would be more likely to comply with the request?  
man      woman
2. How likely would a man be to agree to make a colleague at work redundant if asked to by his boss?  
very unlikely    unlikely    neutral    likely    very likely
3. A female student is asked by her teacher to photocopy a pile of work, but she does not have the time. How likely is the student to say no to her teacher?  
very unlikely    unlikely    neutral    likely    very likely

Closed questions produce quantitative data, which is relatively easy to analyse. You will need to assign a numerical score for each answer. For example, the answers to the second question can be given a score of 1–5: 1 for very unlikely, 2 for unlikely, 3 for neutral, 4 for likely and 5 for very likely. This means that the higher the score, the greater the perception of obedience. However, you may want to consider response bias, which may occur if your questions are not carefully constructed.

You can control this to an extent by question reversal. This means that some of the questions are rephrased to reverse the emphasis. In the examples above, the second question asks about obedience, and the third question asks about dissent. To get an overall score for obedience, the score for the third question should be reversed (a score of 1 will be reversed to be 5, 2 will be 4, and so on).

### MATHS TIP

It is very important that you consider the type of scoring method that you are going to use and how your data is analysed while constructing your questions and designing the format of your questionnaire. It is often the case that lots of closed questions lead to copious amounts of single raw data figures and bar graphs. This can be unhelpful and time-consuming when it comes to analysis.

### Qualitative data

Qualitative data will be gathered by asking participants to complete a story. A story completion method is used to detect underlying attitudes that people may have without directly asking them a question. Typically, a researcher writes the beginning of a story, in this case about obedience, and the participant is asked to finish it. Qualitative analysis can then be done on the themes written about by the participant as they have finished off the story.

**Qualitative story completion task**

Yousef and Aria were told to tidy their bedrooms by their mother. Neither Yousef nor Aria wanted to tidy their rooms, but wanted to go out to play instead. Their mother shouted at them and told them that they would not be allowed to go out to play unless their rooms were tidy.

Mother put Yousef in his room and Aria in her room ...

Please complete the story, detailing what both Yousef and Aria do.

You may wish to use a simpler way to gather qualitative data, by using open-ended questions for example. Some examples of open-ended questions include:

1. In your view, explain whether you think males or females would be more obedient in their workplace.
2. Employees often have to comply with the demands of their employers, sometimes to perform tasks and duties that they would not voluntarily do. Based on this, explain whether you think that males or females would make more obedient employees.

**SAMPLING DECISIONS**

Before you consider which sampling method to choose, you will need to consider the target population that you wish to investigate; this can be the general population or a specific population such as family and friends. Because the aim of this example practical is to investigate perceptions of obedience and gender, it will be important to have a fairly diverse target population with an equal number of males and females. This is because perceptions of gender differences will vary according to biological sex, age and background. You may choose to try to control for these individual differences by using a random sample from a diverse target population, although this may be difficult and time-consuming. To keep it simple, this practical investigation will use a stratified sampling technique to ensure a proportionate distribution of males and females in a student population.

**Stratified sampling technique**

The process of gathering a sample using a stratified sampling technique for this practical investigation is:

1. Target population = A level students
2. Sample required = 50
3. Gather all the names of A level students that attend an educational institution.
4. Calculate the number of males and females in the target population (for example, 55 per cent female, 45 per cent male).
5. Place all the female names in a hat and pick out 27 (55 per cent of 50 is 27.5 – but we cannot have half a person).
6. Place all the male names in a hat and pick out 23 (45 per cent of 50 is 22.7 – but we cannot have 0.7 of a person).

You may wish to consider using a simpler sampling technique such as opportunity or volunteer sampling by asking family and friends or placing an advert in a student common room.



## SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION, ETHICS

## ACTIVITY 2

Once you have chosen your sampling technique, you will need to justify why you have chosen it for the investigation. Your justification may be for practical or ethical reasons. Refer back to the strengths of sampling techniques on pages 41–43 to help justify your choice.

## ETHICAL ISSUES

When designing a questionnaire and considering how and when it will be distributed, a number of specific ethical considerations should be made.

- Has written consent been obtained by every participant?
- Has the nature of the questionnaire been disclosed? If not, what safeguards do you have in place to protect and debrief participants?
- Are participants aware of their right to withdraw?
- Are the questionnaires anonymous so that confidentiality is assured?
- Do the questions violate participant privacy?
- Are the questions in the questionnaire socially sensitive or offensive?
- Have you put safeguards in place to safely store and destroy the questionnaires after the data has been analysed?
- Will participants have access to the results and the full report once it has been written?
- Have you considered risk management in psychological research?

It is critical that these ethical issues are addressed, particularly the way in which questions are phrased, as they may inadvertently cause embarrassment or distress. It is sensible to conduct a pilot study of the questionnaire on a small sample of people, like family and friends, to ensure that any ethical issues are detected and that the questions are clear and understandable.

## SAMPLE BRIEF

*Thank you for agreeing to answer a questionnaire for my psychology investigation. I am interested in how you view obedience in certain situations, so the questions that you will need to answer will be based on incidents involving someone giving orders.*

*For the majority of questions, you will need to decide whether you think a person will obey these orders. You will not be asked any personal questions, and you are free to refuse to answer any or all of the questions.*

*In the second half of the questionnaire, you will be given the beginning of a story that you will be asked to complete.*

*Please be as honest as possible in answering the questions and please complete the questionnaire on your own so that you are not influenced by others.*

*It will take you approximately 20 minutes to complete the questionnaire and it will be completely anonymous. You will not have to give your name, only your gender, and you can return the questionnaire to me in the pre-paid postal envelope. The results and a full write-up of the findings will be available on request. After one week the data will be extracted from your questionnaire response and your questionnaire will be destroyed.*

## SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

## ACTIVITY 3

Using the sample brief, write a brief for your investigation.

## ANALYSIS OF QUANTITATIVE DATA

Once you have gathered your questionnaires, you will need to begin your qualitative and quantitative analysis. Your closed questions will give you the quantitative data that you can present in tables and graphs, and can be summarised using descriptive statistics.

From the data shown in Table 7.1, there is a clear difference in participants' perceptions of male and female obedience, the perception being that females will be more obedient. However, to see this trend more clearly, descriptive statistics should be used. Note that a small sample size has been shown for the purpose of this example. It is important to note that the larger the sample size, the more meaningful the analysis will be.

TABLE 7.1: AN EXAMPLE DATA TABLE USING EXTRACT DATA FROM LIKERT-STYLE QUESTIONS

Participant	Score for perception of male obedience (total)	Score for perception of female obedience (total)
1	25	35
2	20	34
3	14	27
4	22	29
5	19	33
6	17	24
7	21	27
8	21	30
9	18	32

## Descriptive statistics

The data in Table 7.2 shows a clear difference between participants' perceptions of male and female obedience. Females are believed to be far more obedient than men, and this is consistent in all of the measures of central tendency. The range and standard deviation suggest that the rate of agreement between participants about their perceptions of gender and obedience are relatively similar; that is, there is equivalent variation in perceived obedience scores. With quite a high range, it suggests that there is a reasonably large variation in both perceived male and female obedience scores.

TABLE 7.2: AN EXAMPLE OF DESCRIPTIVE STATISTICS

	Male obedience	Female obedience
Mean perception of obedience ( $\bar{X}$ )	19.7	30.1
Mode obedience score	21	27
Median obedience score	21	30
Range	11	11
Standard deviation ( $\sigma\bar{X}$ )	3.16	3.68



## GRAPHICAL REPRESENTATION

Any graphical representation of a data set should be meaningful and take account of the type of data gathered. We can use a bar chart to illustrate the mean score of perceived obedience clearly.

## ANALYSIS OF QUALITATIVE DATA

In this example practical investigation we used a story completion task to gather qualitative data. The first stage of qualitative analysis involves reading the story endings and making a note of any themes that emerge.

TABLE 7.3: PARTICIPANTS' RESPONSES

Participant	Response
Participant 1	<i>'Yousef was in his room but did not want to tidy up, so he played on his game console instead. Aria went to her room and tidied away some of her toys, but she was mad, so she did not tidy them all away. Yousef was told off by his mother again and he eventually tidied away some of his toys, however, he stuffed most of them underneath his bed.'</i>
Participant 2	<i>'Aria went to her room and tidied away all of her toys. She put everything away and then went to help Yousef with his bedroom.'</i>
Participant 3	<i>'Yousef had a tantrum and refused to tidy his bedroom. His sister started tidying her room, but then got bored and decided to shout at her brother. Mum told them both off again, and they both went to their rooms to tidy up.'</i>
Participant 4	<i>'Aria cried and eventually tidied her room. Yousef shouted and banged his door. Eventually both children tidied their bedrooms, but Yousef cried the whole afternoon.'</i>

Using the story endings, there seem to be themes of resistance, obedience and protest. These themes could be further subdivided into types of resistance, obedience and protest, as shown in Table 7.4.

TABLE 7.4: THEMATIC ANALYSIS

Themes	Sub themes	Comments/evidence
Resistance	Refusal to tidy	Yousef had a tantrum
	Not doing a good job	Aria did not tidy them all away Yousef stuffed toys under his bed
	Doing something else instead	Yousef played on his games console
Obedience	Tidying room	Aria tidied all her toys (and went to help Yousef) Aria eventually tidied her toys away
Protest	Crying	Aria cried Yousef cried the whole afternoon
	Shouting	Aria shouted at her brother
	Hitting/banging	Yousef banged his door

From the thematic analysis (Table 7.4) it can be seen that there were two instances of clear obedience, both shown by the female (100 per cent), although the amount of protest was equal for both the male and female. Most resistance was put up by the male (75 per cent). Therefore we can conclude from this simple thematic analysis that there is a perception that males are more likely to resist being obedient and both males and females may protest at being given orders, but that females will be more likely to comply.

## SKILLS

CRITICAL THINKING,  
ANALYSIS, INTERPRETATION,  
COMMUNICATION

## ACTIVITY 4

It is important to consider both the strengths and weaknesses of the practical investigation. There are some important questions to consider:

1. Is the study ethical?
2. Can you generalise the findings to other situations/different cultures/different eras?
3. Is the study reliable?
4. Is the study carried out in a natural or artificial environment?
5. Is the task ordinary?
6. Are the findings useful in real life?
7. Is the research valid?
8. Is there any conflicting evidence from other research?

Not all of these questions will be relevant to your questionnaire, so be selective and pick the strongest comments to make.

**Strengths**

By asking participants about other people's levels of obedience, they are less likely to display social desirability in their responses because it is not directly about them. If the questions related directly to the participant's own obedience, they may have answered dishonestly to make themselves appear either compliant, or non-compliant (as this may be seen as a desirable trait in their social group). By using the story completion method, this practical investigation was able to investigate underlying beliefs about male and female obedience without asking participants about it directly; this increases the validity of the questionnaire.

The questionnaire used in this practical example gathered 50 responses, which is quite a large sample to generalise to others from. This is a strength of questionnaires in general, because a high quantity can be distributed and returned, although you should be mindful that response rates can be low for questionnaires as people may not have the time to complete them. Also, only people who have the time and inclination to complete a questionnaire are likely to do so, which can lead to a biased sample.

**Weaknesses**

Because each question concerned either male or female obedience, the aim of the study was perhaps quite obvious. This could have resulted in participants answering in a way that they thought the researcher was looking for in the investigation. This may account for the high perceived levels of obedience in females, not males, because social norms would suggest that males are less compliant. Generalisability may also be an issue as only students were used in the sample, therefore the findings may not apply to the whole population as perceptions of obedience may change over time and place.

**Suggestions for improvement**

Because we were not using an established questionnaire for perceptions of obedience, the questionnaire was not tried and tested for reliability. Many questionnaires have been tried and tested, so it may be useful to check the reliability of your questionnaire using a test-retest method or split-half technique. A test-retest method would involve asking the same participants to complete the questionnaire again at a later date, although this could be time-consuming. A quicker way to test the reliability of your questionnaire would be to use a split-half procedure. This will involve dividing your questionnaire into two halves and cross-checking the scores obtained in the first half and comparing them to the second half. If the scores match, the construct being tested is more likely to be reliable.



**EXAM TIP**

Other improvements to your practical can be suggested. Consider the sample and sampling technique used to gather participants. Is it likely to be a representative sample or is it biased? Consider how you might improve the sample and how it will affect generalisability of your study findings.

Consider your questionnaire, was it easy for participants to understand the questions asked? Could they have misunderstood the questions? Consider whether you should have done a pilot study to test whether participants could answer the questionnaire properly. This would have improved validity of your findings.

**WRITING UP THE REPORT**

To present your practical investigation in a conventional format for psychology, you will need to follow the conventions of report writing. Report writing involves following a specific structure when presenting your investigation. It is conventional to have sections in your report which present certain aspects of your investigation.

**Conventions of report writing**

**Abstract:** a summary of the background theory/research into obedience, the aims, hypotheses, method, results and discussion. This is a short paragraph overview of the entire report.

**Introduction:** an overview of relevant obedience theories and research. The introduction provides a rationale for the current investigation that links prior research into obedience to the study aims and hypotheses.

**Method:** a detailed account how you went about conducting your obedience investigation, such as the participants, sampling method, apparatus, procedure, controls and ethical issues.

**Results:** a detailed account of the qualitative and quantitative data gathered and its analysis using descriptive statistics and graphical representations of the findings to show how obedience in males and females is perceived.

**Discussion:** conclusions drawn from the results analysis about male and female obedience, reference to prior research, strengths, weaknesses and possible improvements for future research into gender and obedience.

**CHECKPOINT**

1. Which of the following gather qualitative data and which gather quantitative data?
  - a) Rate your level of obedience to your parents on a scale of 1–10 (1 = never obedient, 10 = always obedient).
  - b) Describe a situation in which you refused to follow the order of a teacher.
  - c) If a police officer asked you to pick up litter in the street, explain how you would react.
2. Which of the following statements describes 'social desirability bias'?
  - a) The participant guesses the aim of the study so responds in a way that they believe is expected of them.
  - b) The participant is being questioned by a researcher who is giving non-verbal cues about how to respond.
  - c) The participant says that they are more obedient than they are because obedience is seen as more acceptable.

**SKILLS**

ADAPTIVE LEARNING,  
ANALYSIS, COMMUNICATION,  
CRITICAL THINKING, INTEGRITY,  
INTELLECTUAL CURIOSITY,  
SELF-EVALUATION

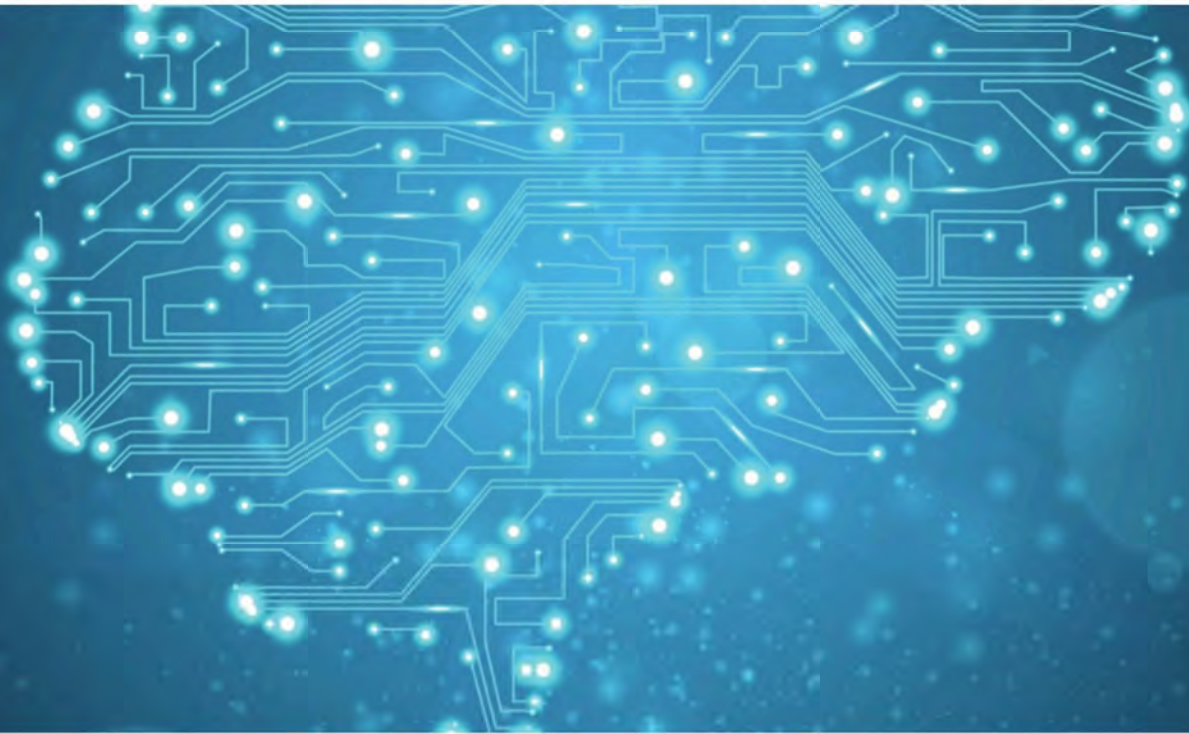
**EXAM PRACTICE**

1. In your social practical investigation you will have completed an analysis of qualitative data.
  - a) Describe the sampling technique you used in your practical investigation. (2 marks)
  - b) Describe how you analysed the qualitative data from your social practical investigation. (2 marks)
  - c) Explain one strength and one weakness of how you analysed the qualitative data from your social practical investigation. (4 marks)
  - d) Explain one improvement you could make to the procedure of your practical investigation. (2 marks)



# TOPIC B

# COGNITIVE PSYCHOLOGY



Cognitive psychology is the study of the role of cognitive processes in human behaviour. Cognitivists study mental processes, such as perception, memory, attention, language and problem solving. This is to understand how we view, interpret and respond to our world.

An important development in the rise of the cognitive approach was the advent of the computer age. The computer gave cognitivists the metaphor for understanding the human brain and the terminology to explain mental processing more easily. The computer analogy likens the brain to a computer: a storage system that receives information from our environment, processes the information and gives an output. The computer hardware resembles the structural features of our brain and the software resembles the experience that we write into the program or system.

Experimental cognitive psychology is the study of human mental functioning in a controlled laboratory setting. It uses experimental tests to determine functioning. Cognitive science is a field that is concerned with mimicking human cognition in a computer program, modelling computer simulations and offering computational models for various aspects of cognition. Cognitive neuropsychology is the study of patients with brain damage to determine the impact of the damage on capacity and functioning. These studies have been particularly important in understanding the cognitive function that we refer to as memory.



# CHAPTER 8

## MEMORY: THE MULTI-STORE MODEL

### LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand the multi-store model of memory (Atkinson and Shiffrin, 1968) including information processing, encoding, storage, retrieval, capacity and duration
- evaluate the multi-store model of memory.

### GETTING STARTED

Test the capacity of your short-term memory store.

After reading each line of digits, one at a time, write down the digits in the list in their correct order.

3 9 8

2 7 9 4

9 5 1 3 7

1 6 3 5 7 9

7 5 9 1 3 6 8

5 7 4 2 9 6 1 8

8 1 4 2 6 9 7 3 5

The number of digits in the line you recalled without error is your digit span.

### KEY TERMS

**control processes:** conscious decisions about what to attend to from the sensory information in our environment

**rehearsal:** consciously rehearsing and repeating items

**tachistoscope:** a device used to present visual information in a controlled way, typically to test sensory memory

**visual array:** an arrangement of digits or letters

### THE MULTI-STORE MODEL OF MEMORY (ATKINSON AND SHIFFRIN, 1968)

Richard Shiffrin and Richard Atkinson proposed a general theoretical framework for understanding human memory, often referred to as the multi-store model of memory. Atkinson and Shiffrin distinguished between the permanent structural features of memory and its **control processes**. The structural features of memory can be seen as similar to the hardware and built-in programs of a computer which cannot be altered by the programmer, which amount to the basic memory stores of human memory. The control processes involved in memory are seen as similar to programs that the programmer can write into the computer and which determine the operations that the computer can perform. These control processes involve the way we encode, rehearse and retrieve memories.

### WIDER ISSUES AND DEBATES

#### Reductionism

This model has been criticised for being overly simplistic: that it underplays the interconnections between the different memory systems by proposing that the memory has distinctly different stores. Artificially breaking up the memory stores makes it easier to study memory experimentally, but this model can be criticised for being reductionist.

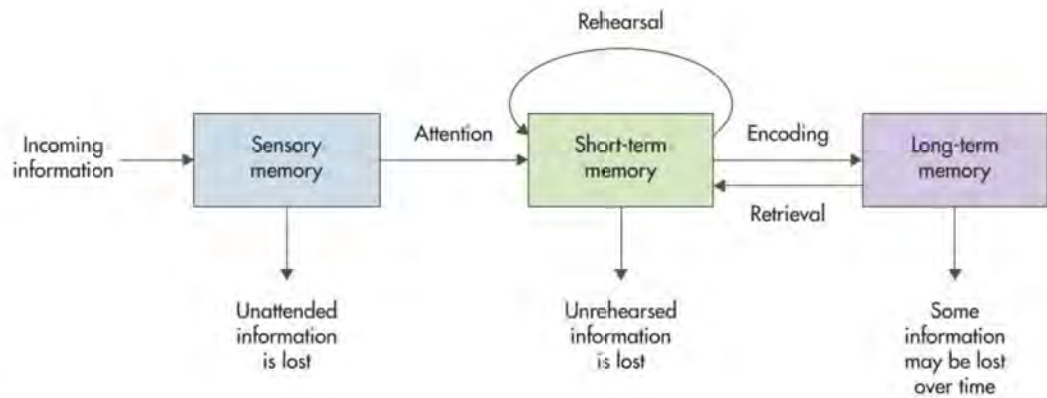
The multi-store model describes memory as consisting of three different stores: a sensory register, short-term store and long-term store (see Figure 8.1).

### SENSORY REGISTER

We experience our world through our five senses, and it is believed that we have a sensory register for each of these sensory modalities (seeing, hearing, touching, tasting and smelling). The visual sensory register has been widely researched where a **visual array** of letters is presented via a **tachistoscope** for a moment and then a direction is given



to recall the whole or a specific row of the array (see Figure 8.2). Participants typically recalled on average 4.32 letters of the whole array (Sperling, 1960, 1963). Thus, the sensory register can hold only a limited amount of information for only a few hundred milliseconds before it is lost. **Attended information** from the sensory register is transferred to the short-term store for processing.



► Figure 8.1 The multi-store model of memory, adapted from Atkinson and Shiffrin, 1968

D	V	Y	Q
P	U	J	A
S	M	E	K

▲ Figure 8.2 A visual array

## KEY TERMS

**attended information:** sensory information that is given attention

**digit span:** how many digits can be retained and recalled in sequential order without mistakes

**interference task:** a task that prevents rehearsal, such as counting backwards

**trigram:** a set of three digits or letters

## SHORT-TERM STORE

The second memory store is the short-term memory store. Information that is attended to enters the short-term store and is held temporarily for 15–30 seconds. It is then assumed to decay completely unless it can be maintained through maintenance rehearsal. Lloyd Peterson and Margaret Peterson (1959) investigated the duration of short-term memory using an **interference task** to prevent rehearsal. Participants were required to remember a **trigram** of three consonants for intervals of 3, 6, 9, 12, 15 and 18 seconds. Each trigram was read out and participants were then given a number, from which they had to count backwards in threes (for example, 679, 676, 673). Correct recall of the trigram was likely after a short interval, but performance dropped rapidly after 15–18 seconds. Assuming that the interference task prevented rehearsal of the trigram, it can be concluded that decay occurs in the short-term store over a period of around 20 seconds.

The capacity of the short-term store was around five to eight items of information. George Miller (1956) refined this figure to 'the magical number seven, plus or minus two'. We can therefore view the short-term store as a series of between five and nine spaces in which items of information can be stored.

Forgetting in short-term memory can occur because new information displaces older information. **Digit span** experiments suggest that we are able to maintain between five and nine items and, as more information is input into the store, older information or information with a weaker memory trace is knocked out (displaced).

## SKILLS

CREATIVITY, ETHICS, PROBLEM SOLVING

## ACTIVITY 1

Imagine you are conducting a field experiment to test the capacity of short-term memory. A field experiment involves testing memory in an everyday way. Consider how you might go about testing the capacity of short-term memory in a realistic way.



**KEY TERM**

**phonological similarity effect:** similar sounding words and letters are acoustically confused in short-term memory, making them more difficult to recall

A memory trace in the short-term store is held in an auditory or verbal form, which is called acoustic encoding. Maintenance rehearsal involves repeating the sounds over and over to form a stronger memory trace which can be transferred to long-term memory. Alternatively, if we consider the meaning of the information and its significance, a form of elaborative rehearsal, we can transfer the information into long-term memory. We know that the short-term store uses acoustic encoding because of the **phonological similarity effect** (Conrad and Hull, 1964): letters and words of a similar sound presented to participants are more difficult to recall than dissimilar sounding letters and words. The similarity of sounds leads to confusion in the short-term store, suggesting that the encoding in this store is primarily acoustic (auditory or verbal).

**SKILLS**

COMMUNICATION, ANALYSIS,  
CRITICAL THINKING

**ACTIVITY 2**

You can investigate encoding in short-term memory by replicating the phonological similarity test. Here is a list of rhyming words and a list of non-rhyming words;

- man, cab, can, cad, cap, mad, max, mat, cat, map
- pit, few, car, pen, sup, bar, day, hot, rig, bun.

Present the rhyming words to a group of participants using a projector or screen at a rate of one word every three seconds. When the word list has been presented, ask participants to recall the words in the correct sequence. It might be useful to ask participants to recall the words on a piece of paper numbered 1 to 10. Repeat the same procedure with the non-rhyming words. Compare the number of words recalled accurately in the correct position in the list.

**WIDER ISSUES AND DEBATES****The use of psychological knowledge in society**

Rehearsal, or the refreshing of information, can reinforce learned information. Andrew Butler and Henry Roediger (2007) simulated a classroom environment where participants viewed three different lectures on consecutive days. Following each lecture, some participants were given a short recall test to refresh their memory and some did not receive these tests. One month later, the participants were tested for their memory of the lectures. They found significant evidence to suggest that the short recall tests reinforced knowledge for long-term memory of the lecture content. This evidence can be used in educational practice to help students learn more effectively.

**THINKING LIKE A PSYCHOLOGIST**

Consider your own revision methods. Do you rehearse information over and over to remember it better? While rehearsal is one way of storing information in long-term memory, it is not the only method. Fergus Craik and Robert Lockhart (1972) describe an alternative framework for memory called the Levels of Processing Approach. Investigate this alternative approach further and consider how this different theory of memory could be used to aid your own revision.

**LONG-TERM STORE**

Atkinson and Shiffrin (1965) explained that information in long-term memory is encoded semantically, according to its meaning. Alan Baddeley (1966b) found that participants learning a sequence of semantically similar words recalled less well than participants learning a sequence of semantically unrelated words. Baddeley explains that this occurs because the semantically similar words are confused, because long-term memory relies upon semantic encoding.



The duration of long-term memory is potentially a lifetime. Harry Bahrick et al. (1975) investigated Very Long-term Memory using a series of memory tests on the names and faces of students in high school yearbooks. Four hundred participants between the ages of 17 and 74 years old were tested. They found that identification of names and faces was 90 per cent accurate within 15 years of leaving school and between 70 to 80 per cent accurate 48 years after leaving school.

The capacity of long-term memory is potentially infinite. Timothy Brady et al. (2008) showed participants 2 500 objects over the course of 5.5 hours. They were then shown pairs of objects and asked to identify which of the two objects they had seen. They found that object recognition was over 80 per cent.

## EVALUATION OF THE MULTI-STORE MODEL OF MEMORY

### STUDIES OF PATIENTS WITH BRAIN DAMAGE

Evidence to support the distinction, particularly between the short-term and long-term stores, comes from case studies of brain-damaged patients and experimental evidence from memory studies. Henry Molaison suffered amnesia following brain surgery for epilepsy, resulting in severe impairment to his long-term memory although his short-term memory was largely intact. This case study demonstrates that the short-term and long-term memory stores were differentially affected by the brain damage caused, perhaps because they are located in different regions of the brain. Similarly, Clive Wearing suffered long-term memory impairment following **encephalitis**, but his short-term store remained unaffected. In both cases the patient was unable to transfer information from the short-term store to the long-term store. Case studies such as these demonstrate the separation between short-term and long-term memory and support the distinction proposed by the multi-store model of memory. However, the subjects of case studies are unique and the nature of the brain injury sustained by each individual is equally unique, so we may not be able to generalise such a distinction based on individual cases alone. Despite this problem, amnesia research offers fairly convincing evidence for the distinction between short-term and long-term memory.

Case studies of brain-damaged patients that are used to support the multi-store model of memory can also be used to highlight the overly simplistic view of long-term memory. Clive Wearing, musician and chorus master, could not recall past events in his life, but he could remember how to play the piano and conduct an orchestra. This suggests that long-term memory is not one single unitary store, but that perhaps we have different long-term stores for procedural memory of practised skills and abilities, and other long-term stores for factual information and autobiographical events.

#### KEY TERM

**encephalitis:** inflammation of the brain causing damage to the structures of the brain



▲ Memory for practised skills may be stored separately from stores for factual information

### WIDER ISSUES AND DEBATES

#### Ethical issues

Case studies of brain-damaged patients are often anonymised by using the initials of the patient rather than their full name; for example, until his death, Henry Molaison was only known as HM. This helps to protect patients' identities and maintains their right to privacy. In fact, the identity of Henry Molaison was fiercely defended by the researchers involved in his care. Despite being the most widely cited case study in the history of psychology, his identity was protected for over 55 years. However, in high-profile cases, such as Clive Wearing who was in the public eye, these individuals cannot be anonymised. This can lead to issues of privacy being violated as the research concerning the case is available within the scientific community and public arena.

Case studies of brain-damaged patients also raise the question of consent. If someone is unable to remember that they gave consent, is this really consent and does this affect their right to withdraw?

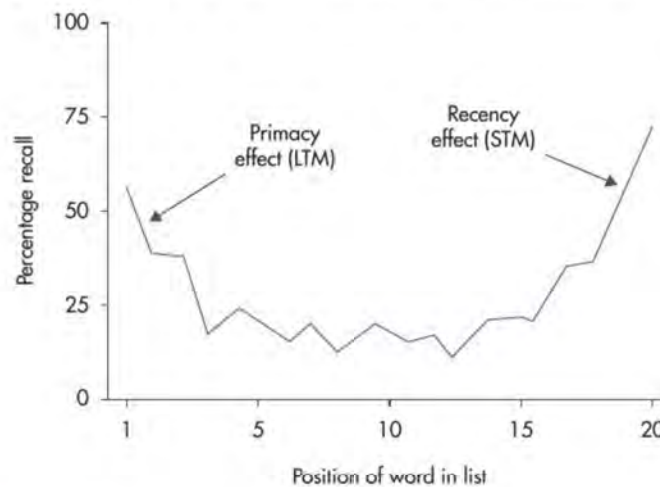


**KEY TERM**

**serial position effect:** recall of information at the beginning and end of a list is higher than the middle of the list

**SERIAL POSITION EFFECT**

Compelling evidence for the existence of separate short-term and long-term memory stores comes from the **serial position effect** or primacy–recency effect. Murray Glanzer and Anita Cunitz (1966) conducted an experiment to investigate whether the position of a word in a list affected recall. They found that participants recalled more words from the beginning (primacy effect) and end (recency effect) of the word list, but recalled few from the middle of the list. It was thought that words recalled at the beginning of the list had the chance to be rehearsed, and memory for these words would have been strengthened and transferred to the long-term store. While the words at the beginning of the list are being processed, words in the middle of the list were filling up the slots in the short-term store. Words at the end of the list acted to displace the older memory trace for the middle words, leaving only words at the end of the list in the short-term slots.



► Figure 8.3 The serial position curve demonstrates the difference between short-term and long-term stores

**KEY TERM**

**dual task experiment:** experiments that involve two tasks that either compete with each other for the same cognitive resource because they are similar tasks (two verbal or two visual tasks), or involve different cognitive resources because they are different tasks (one verbal and one visual)

**ALTERNATIVE EXPLANATIONS**

The multi-store model of memory has often been criticised for being an overly simplistic view of human memory. In particular, it fails to address the dynamic nature of short-term memory and our performance on **dual task experiments**. Dual task experiments show that we perform poorly when trying to deal with similar cognitive tasks, but perform well when trying to do two different cognitive tasks. For example, we tend to perform poorly when asked to do two verbal tasks or two visual tasks simultaneously, but perform well when given one verbal and one visual task together. Dual task performance cannot be explained by the short-term store, which assumes that capacity is unaffected by type of task. A different explanation of short-term memory, proposed by Alan Baddeley and Graham Hitch in 1974, can explain dual task performance and is seen as a more dynamic model of short-term memory (this will be discussed in detail on pages 88–91).

The multi-store model has also been criticised for the emphasis given to rehearsal in the transfer of information from short-term to long-term storage. Although we do use rehearsal as a memory strategy, it is not essential for permanent learning to take place. In fact, we are often able to learn new skills and information without consciously trying to learn them. Using imagery is one such example of a memory strategy that leaves a strong long-term memory trace without the need for rehearsal.

The multi-store model has additionally been criticised for presenting an overly simplistic account of long-term memory. Endel Tulving (1972) suggests that we have different long-term memory stores for different types of information. The episodic memory stores autobiographical information about personal experiences we have had; semantic memory stores encyclopaedic knowledge, such as facts; and procedural memory stores skills we have learned, such as riding a bicycle. This alternative theory of memory is supported by case studies of brain-damaged

patients, such as Henry Molaison and Clive Wearing, who suffered amnesia which impaired their episodic memory, but their procedural and semantic memory was unaffected.

**SKILLS**

ANALYSIS, CRITICAL THINKING

**ACTIVITY 3**

Here is a summary of the studies which have researched the different stores of the multi-store model. Briefly summarise their findings.

	Capacity	Duration	Encoding
<b>Short-term memory</b>	Miller (1956)	Peterson and Peterson (1959)	Conrad and Hull (1964)
<b>Long-term memory</b>	Brady et al. (2008)	Bahrick et al. (1975)	Baddeley (1966b)
<b>Evidence for separate STM-LTM stores</b>	Glanzer and Cunitz (1966) Clive Wearing Henry Molaison		
<b>Evidence/theory against the multi-store model</b>	Dual processing tasks Working memory (Baddeley and Hitch, 1974) Tulving's reconceptualisation of LTM (1972)		

**WIDER ISSUES AND DEBATES**
**An understanding of how psychological knowledge has developed over time**

Despite these criticisms, the multi-store model of memory proposed by Atkinson and Shiffrin has been a valuable framework in understanding human memory that has stimulated a huge wealth of memory research. Because of the development of this model of memory, better and more precise theories of memory have been proposed.

**EXAM TIP**

When evaluating the multi-store model of memory, it is important to use research evidence that highlights the qualitative and quantitative differences between the short-term and long-term stores.

It is not enough to state that Miller (1956) found that the short-term store could hold between five and nine bits of information, without contrasting this to the capacity of the long-term store.

It is also very important to explain **how** the research supports or goes against the model. Simply stating the research findings without linking back to the model is not effective evaluation.

For example:

**Point:** Clive Wearing suffered amnesia which meant that he could not remember events from his past or store new memories. However, his short-term memory was not impaired.

**Link:** This supports the multi-store model of memory as it shows that his long-term store was damaged, but his short-term store was unimpaired. These stores must be independent of one another.



**CHECKPOINT**

Which store are the following statements describing?

1. Encoding is acoustic
2. The capacity is 7 plus or minus 2
3. The duration is potentially a lifetime
4. Encoding is semantic
5. The duration is around 20 seconds
6. Encoding is dependent on the sense being used
7. Information is forgotten through displacement

**SKILLS**

ANALYSIS, COMMUNICATION,  
CRITICAL THINKING,  
INTERPRETATION, REASONING

**EXAM PRACTICE**

1. Bashir needs to revise for his biology test. He is struggling to learn the functions of organs in the body, such as the heart and lungs. Bashir read his biology textbook in class and took notes but cannot remember all of the information about how organs function. He has taken his biology textbook home to learn and plans to use his textbook and notes to help revise for the test. Explain how the multi-store model (Atkinson and Shiffrin, 1968) could be used to help Bashir remember the function of organs in the body. (4 marks)
2. Smaragda is planning her revision for her end-of-year exams. She plans to put her class notes onto flashcards and go through each flashcard six times before writing out the information later to see what she remembers.
  - a) Describe, using the multi-store model of memory (Atkinson and Shiffrin, 1968), how Smaragda is using information processing during her revision. (2 marks)
  - b) Explain, using the multi-store model of memory (Atkinson and Shiffrin, 1968), two further ways that Smaragda could revise for her end-of-year exam. (4 marks)

# CHAPTER 9

## MEMORY: THE WORKING MEMORY MODEL

### LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand the working memory as a theory of short-term memory (Baddeley and Hitch, 1974)
- know the different components of working memory, including the central executive, phonological loop, visuospatial sketchpad and episodic buffer
- evaluate working memory.

### GETTING STARTED

A useful exercise to demonstrate working memory is to visualise and count the number of windows in your home. You will be able to visualise each window and navigate around your home like going on a journey. This exercise uses a component of working memory known as the visuospatial sketchpad.

You can also test the visuospatial sketchpad with friends. Place a group of objects on a tray and show them to your friends. Now cover the tray and remove an item. Show the tray to your friends and see if they can spot the missing item. The object and its location on the tray is testing the visuospatial sketchpad.

### WORKING MEMORY MODEL (BADDELEY AND HITCH, 1974)

Alan Baddeley and Graham Hitch first proposed the theory of working memory as a three-component short-term memory system in 1974. The idea of a working memory was not a new one; in fact, Atkinson and Shiffrin (1968) used the label 'working memory' for the short-term store within their multi-store model. Baddeley and Hitch noted significant problems with the multi-store explanation of working memory because it was overly simplistic and emphasised the role of rehearsal as being critical to learning. Baddeley and Hitch set about trying to understand short-term memory as a complex and active working memory.

### WIDER ISSUES AND DEBATES

#### The use of psychological knowledge within society

Research into working memory and its assessment has helped to identify children who have working memory impairments which mean that they struggle with scholastic activities in the classroom and often fail in education. Children with working memory problems may have difficulty concentrating, remembering lengthy instructions or with complex vocabulary. Working memory research has led to a variety of classroom interventions designed to help improve the learning and educational success of children with poor working memory skills (Gathercole and Alloway, 2008), although other researchers argue that these improvements in achievement may be specific and short-lived (Melby-Lervåg and Hulme, 2012).

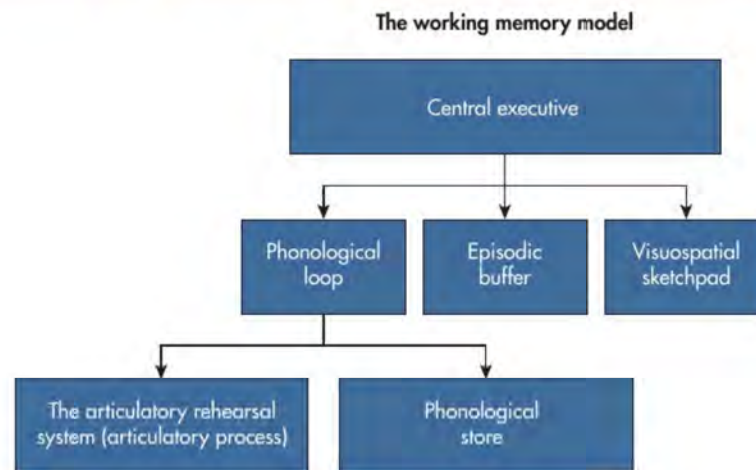
### KEY TERM

**slave systems:** the phonological loop and visuospatial sketchpad are referred to as slave systems because they play a subordinate role to the central executive, as such they serve the central executive which coordinates activity of the working memory. The term slave system is used in a technical (not historical) sense to illustrate the hierarchy within working memory

### THE DIFFERENT COMPONENTS OF WORKING MEMORY

In their original model, Baddeley and Hitch proposed three components for working memory: a central executive that would deal with the running of the memory system, and two **slave systems** to deal with verbal and visual information (see Figure 9.1). Overall, working memory was seen as a limited capacity system only able to deal with a restricted amount of information temporarily while it could be manipulated or worked with.





► Figure 9.1 Baddeley and Hitch's model of working memory

The role of working memory is therefore to temporarily store and manipulate information being used. We rely on working memory for many functions, such as remembering telephone numbers and lists, comprehending sequences of words in the form of sentences, mental calculation and reasoning. However, working memory is fragile and frequently susceptible to distraction (someone talking to you while you are trying to remember a number), overload (a long list of items) and overwork (complicated calculations).

### THE CENTRAL EXECUTIVE

The central executive was originally described as a limited capacity component involved in general processing. It was essentially seen as having a supervisory role in coordinating the functioning of the two slave systems. It was also regarded as having limited capacity but with the ability to deal with different types of sensory information (**modality free**). It is defined as an attentional controller with the capacity to focus, divide and switch attention. Its role is to receive information from the senses and allocate verbal and visual information to the slave systems of the working memory.

#### KEY TERM

**modality free:** able to process different forms of information (acoustic, visual, haptic, etc.)

### WIDER ISSUES AND DEBATES

#### Psychology as a science

The central executive in memory is a largely theoretical concept with limited experimental support. Because it is abstract it is not directly testable and does not meet the criterion of being scientific as empirical data cannot be gathered.

### THE PHONOLOGICAL LOOP

The phonological loop is a slave system that deals with the temporary storage of verbal information. The phonological loop was initially believed to have two components: the articulatory rehearsal system (articulatory process) and the phonological store. The phonological store was only able to hold a limited amount of verbal information for a few seconds. This could be extended if the information was subvocalised or refreshed using the articulatory rehearsal system.

The phonological store can explain the phonological similarity effect, where it is more difficult to remember similar sounding words and letters (man, cad, mat, cap, can) compared to words and letters that sound different from one another (pen, sup, car, day, hot). However, this effect was not true of remembering words that had semantic (meaning) similarity (huge, long, wide, tall, large) or words that were semantically unrelated (thin, wet, old, late, strong). This demonstrates that the phonological store relies on acoustic encoding for storage (Baddeley, 1966a).

### WIDER ISSUES AND DEBATES

#### Psychology as a science

Much of the research into working memory is experimental and laboratory based, involving the testing of specific hypotheses concerning the nature of short-term memory and that have testable outcomes (for example, word recall/accuracy). This research meets many of the criteria of being scientific because there is an emphasis on control, objectivity and replicability.

The articulatory rehearsal system was used to explain the word length effect, where short monosyllabic words (cat, rug, hat) were recalled more successfully than longer polysyllabic words (intelligence, alligator, hippopotamus). Essentially, longer words filled up the limited capacity of the articulatory rehearsal system resulting in the decay of words positioned earlier in the list. The longer the word the more capacity was used up and forgetting was more likely. It could also explain why there was deterioration in recall when rehearsal was prevented through articulatory suppression (repeating the word 'the' while learning a word list).

### SKILLS

COMMUNICATION, ANALYSIS,  
CRITICAL THINKING

### ACTIVITY 1

You can test the word length effect by asking a group of friends to read and recall lists of short words and long words. Present the word list of short words below one at a time to a group of friends. After they have seen all the words in the list, ask them to recall the list by writing down the words they can remember. Now repeat the same procedure with the list of long words. Compare the number of short and long words recalled. It may be useful to calculate the average number of words recalled from each list to help draw conclusions about the word length effect.

Short words	Long words
1. Bell	1. Association
2. Twice	2. Representative
3. Calm	3. Discouragement
4. Share	4. Meaningfulness
5. Tree	5. Suppression
6. Read	6. Enhancing
7. Sun	7. Component
8. Four	8. Performance
9. Key	9. Forgetting
10. Short	10. Damaging

### KEY TERM

**specific language impairment:** a condition in individuals whose language skills are much lower than other cognitive skills such as IQ and non-verbal abilities

Subsequent research into the phonological loop has provided an understanding of why it may have evolved. Researching an Italian woman (VP) with an acquired phonological impairment, Baddeley found that she was unable to retain any vocabulary learned from a different language, suggesting that the phonological loop may have evolved for language acquisition (Baddeley et al., 1988).

Further research using children who had **Specific Language Impairment** (SLI) demonstrated that they found it incredibly difficult to recall non-words in the English language (slimp, dar, gep), and this correlated to the size of their vocabulary. This finding suggested that the phonological loop was necessary for language acquisition and that deficits in this component of working



memory resulted in difficulty learning and comprehending novel language (Gathercole and Baddeley, 1996). Non-word repetition tasks are now a standard and widely used test for an indicator of Specific Language Impairment.

### VISUOSPATIAL SKETCHPAD (VSSP)

This slave system of working memory was described to temporarily hold and manipulate verbal and spatial (position/location) information. The role of the VSSP is to maintain and integrate visual and spatial information from these different channels using a visual code, but it has a limited capacity. It processes visual and spatial information such as shape, colour and tracking the location and movement of objects.

Recent research has attempted to distinguish between the visual and spatial components of the VSSP using tasks that test memory span. Spatial span has been tested using the Corsi block tapping task, where participants are presented with a series of blocks on a screen that light up in a sequence that they have to repeat. Error frequency increases with the number in the sequence, suggesting a limited capacity to spatial memory. Darling et al. (2007) investigated the nature of the visuospatial sketchpad which will be discussed in more detail on pages 134–136.

### THE EPISODIC BUFFER

The episodic buffer is an additional component of working memory which was added to the original theory in 2000. The episodic buffer is a temporary store of limited capacity, with the role of integrating information from different sources, including the central executive, phonological loop, visuospatial sketchpad and long-term memory. The episodic buffer can process information in both auditory, spatial and visual forms. The original working memory theory was unable to explain why we could store only a limited number of word sequences in the phonological loop but could store far longer sentence sequences (up to 15 to 20 sentence units). It seemed that word sequences in the form of sentences could be bound together by meaning and grammar that could not be explained by the limited capacity of the phonological loop alone. This somehow related to information held in the long-term memory. A further problem with the original model was that it did not explain evidence from verbal span experiments that verbal and visual encoding could be combined. The model could not explain how the subcomponents could interface with each other or with long-term memory. Baddeley addressed this with the addition of the **episodic buffer**.

#### KEY TERM

**episodic buffer:** a subcomponent of the working memory associated with interfacing with long-term memory and integrating information from other subcomponents

### EVALUATION OF THE WORKING MEMORY MODEL

Evidence for separate visuospatial and phonological subsystems comes from both neurophysiological evidence and experimental research.

### NEUROPHYSIOLOGICAL EVIDENCE

Williams syndrome is a rare condition where individuals show normal language ability but impaired visual and spatial ability. Individuals with this condition are affected by the same phonological factors, such as word length and word similarity, as the general population, but perform poorly on Corsi block tapping tests. This offers clinical evidence for separate visuospatial and phonological subsystems. Interestingly, children with Williams syndrome were also found to have significant problems comprehending sentences with spatial prepositions (words that describe the position of an object in relation to another object, such as behind, underneath, against), suggesting an association between visuospatial memory and language acquisition (Phillips et al., 2004).

Further neurological evidence comes from the single case study of KF (Shallice and Warrington, 1974) who suffered short-term memory impairment following a motorbike accident that damaged the parietal lobe of his brain. KF had a digit span of one to two items of information, suggesting a gross impairment in his phonological store, but his visual memory



## KEY TERMS

**Broca's area:** an area of the left (typically) frontal lobe associated with the production of language

**neuroimaging:** images showing the structure or function of the brain using scanners such as an MRI or CAT

**PET scan:** a Positron Emission Tomography is a brain scan that allows us to see brain functioning.

**supramarginal gyrus:** an area of the parietal lobe of the brain associated with the perception of language

was intact. In contrast, Henry Molaison suffered from a gross impairment in his spatial memory with a relatively unaffected short-term memory for verbal information. This supports the proposal that working memory has two subsystems to deal with verbal and visuospatial information relatively independently. Neuropsychological case studies offer an insight into memory function but are limited to unique individuals with specific impairments so care should be taken when generalising these findings.

## EVIDENCE FROM NEUROIMAGING

**Neuroimaging** has also offered some evidence for the localisation of the different subcomponents of working memory in the brain. Erardo Paulesu et al. (1993) demonstrated that different regions of the brain were activated when undertaking tasks that employed the phonological store and the articulatory rehearsal system. Using a **PET scan**, they found that the **Broca's area** was activated during a subvocal rehearsal task (remembering words) and the **supramarginal gyrus** was activated when the phonological store was being used. This research provides evidence for the phonological loop and its separate subcomponents. However, the exact location of the central executive has been difficult to find as it is largely diffuse across the cortex.

## EXPERIMENTAL EVIDENCE

Dual task experiments require participants to perform two tasks simultaneously that involve one or more slave systems of working memory. Baddeley and Hitch (1976) conducted an experiment where participants had to simultaneously use a pointer to track the location of a moving light on a screen while imagining the capital letter 'F' and mentally tracking the edges of the letter and verbally saying whether the angles they imagined were at the top or bottom of the image. Participants could easily complete each task separately, but had difficulty performing the tasks simultaneously. This shows how two visual tasks both compete for the limited resources of the visuospatial sketchpad, resulting in impairment in performance. However, when participants were asked to perform the visual tasks while undertaking a verbal task at the same time, performance was not affected because one task used the visuospatial sketchpad, and the other task used the phonological loop. Dual task experiments offer support for separate visual and verbal slave systems because performance is affected by whether the tasks compete for the limited resources of the same or different slave systems.

## SKILLS

CREATIVITY, DECISION MAKING,  
COMMUNICATION, ANALYSIS

## ACTIVITY 2

Design and conduct your own dual processing task experiment. Design two verbal tasks that participants have to perform simultaneously, such as remembering a list of words while reciting a poem. Now design a visual task, such as drawing a house, that participants have to perform while remembering a list of words. Test the ability of the participants to recall the list of words in each condition.

Compare the results for each condition using descriptive statistics such as mean, median and mode.

The word length effect offers evidence for the nature of the phonological loop. Longer words (university, representative) take up more capacity of the phonological loop than shorter words (dog, tree), because they take longer to pronounce/articulate. This effect demonstrates that the phonological loop is a limited temporary store of acoustic and verbal information because longer words occupy more of the capacity of the phonological loop than shorter words and take longer to rehearse.

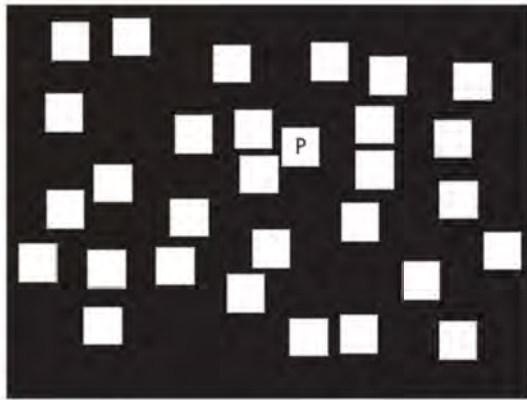
Marià Sebastián and Laura Hernández-Gil (2012) investigated the developmental pattern of the phonological loop among Spanish students aged 5 to 17 years old using a digit span



test. The average digit span was recorded for different age groups and it was found that digit span increased with age; the starting point of this development was when children are able to sub-vocalise around the age of 7 years. They also found that the digit span in the Spanish population was shorter than in the Anglo-Saxon population, probably due to the word length effect associated with how long it takes to pronounce digits in each language.

### RESEARCH INTO SEPARATE VISUAL AND SPATIAL MEMORY SYSTEMS

Recent research into the visuospatial sketchpad has been concerned with distinguishing between the visual and spatial components. Klauer and Zhao (2004) found that visual memory tasks were more disrupted by visual interference and spatial tasks more disrupted by spatial interference, offering evidence for separate components to the visuospatial sketchpad.



▲ Figure 9.2 Stimulus used by Darling et al. (2007)

This separation of components was further supported by Darling et al. (2007), where 72 non-student participants were all presented with a series of 30 white squares positioned randomly on a black screen (see Figure 9.2). In one of the squares was the letter 'p'. Participants had to recall either the appearance (font) of the letter 'p' or its location within a square on the screen. Participants then experienced either spatial interference by having to tap a sequence of keyboard keys in a figure of eight, or experience a visual disruption task in the form of a visual array of black and white flickering dots on the screen, before they saw the screen again.

The researchers found that the spatial interference task disrupted spatial memory but not memory for appearance, and that the visual disruption task affected, to a lesser extent, memory for appearance but not for location.

This provides evidence for separate visual and spatial memory systems; however, visual memory often has to contend with an array of visual stimuli rather than just one category of visual information (the letter 'p'), so this experiment does not reflect everyday visual processing of images. This study will be discussed in more detail on pages 137–39.

David Lieberman (1980) criticises the concept of the visuospatial sketchpad as proposed by the Working Memory model. Working with individuals with **congenital blindness**, he suggests that working memory may not operate in the same way for them because they lack visual experiences upon which the visuospatial sketchpad is based. Lieberman's research suggests that individuals with congenital blindness may use other sense modalities to perform tasks that would typically rely upon the visuospatial sketchpad in sighted individuals. This suggests that a more inclusive and comprehensive understanding of the working memory components is needed.

### ALZHEIMER'S DISEASE AND THE ROLE OF THE CENTRAL EXECUTIVE

Evidence for the coordination role of the central executive is far less extensive than research into the subsystems; nevertheless research with clinical patients suffering from **Alzheimer's disease** has shown decreased central executive function as the disease has progressed. Baddeley et al. (1991) conducted a series of dual task experiments on young, elderly and Alzheimer's patients using verbal and visual tasks together or separately. The performance of the Alzheimer's group did not differ significantly from the other groups when performing a visual or verbal task, suggesting that the phonological loop and visuospatial sketchpad were intact. It did, however, show significant impairment when trying to do them together, suggesting a central executive impairment. According to Baddeley et al., the central executive is responsible for the coordination of the subsystems, so this impairment in performance demonstrates significant problems with executive functioning. However, there is a lack of understanding of the role of the central executive. While it is thought to play a role in attention, the precise function and characteristics of the central executive are yet to be defined, and its location in the brain yet to be located.

#### KEY TERMS

**alzheimer's disease:** a neurological degenerative disease that impairs cognitive functioning causing memory loss and impairments in thinking and language

**congenital blindness:** blind since birth



## SKILLS

ANALYSIS, CRITICAL THINKING,  
REASONING

## ACTIVITY 3

You need to be able to demonstrate strengths and weaknesses of working memory, but you may also be asked to evaluate the subsystems specifically. Copy and complete the following table to secure your revision:

Component	Strengths	Weaknesses
Central executive		
Phonological loop		
Visuospatial sketchpad		

## THINKING LIKE A PSYCHOLOGIST

There is a huge amount of experimental research into working memory, much of which involves laboratory research using specifically designed verbal and visual learning tasks. Consider how well this research represents everyday use of working memory and the implications of this for understanding everyday memory.

## EXAM TIP

Describing the working memory model requires a straightforward recount of the facts about the explanation. The command word 'describe' means that you will need to write about the original model and each of the subcomponents in terms of their features (capacity, function, coding). The amount of detail will need to be guided by the mark allocation and available writing space. You are not required to evaluate the theory, but you can use examples to help elaborate your description points.

You will be required to demonstrate your knowledge and understanding of this theory by being able to explain different situations; for example, explain why you may find it difficult to process two sets of visual or verbal information simultaneously. Try to use your knowledge of working memory to explain the following situation. Remember that the command word 'explain' means that you need to make a point (why it is difficult) and then justify your point (expansion or explanation). You should refer to the context to show application of knowledge.

**Example:** Why is it difficult to process two conversations simultaneously, such as when you are talking on the phone and a friend is trying to tell you something at the same time?

**Point:** It is difficult to process both conversations because they are verbal and both utilise the phonological store.

**Expansion:** The articulatory rehearsal system may be overloaded by two people talking at the same time, so we are unable to recall all the information.



**CHECKPOINT**

1. Which component of working memory is being described in the statements below?
  - a) The component which integrates information between slave systems and long-term memory
  - b) The component which rehearses verbal information
  - c) The component which receives sensory information with the capacity to focus, divide and switch attention
  - d) The component which processes visual informationComplete the following multiple-choice questions.
2. What is the role of the central executive?
  - a) The processing of visual and spatial information
  - b) Rehearsing sounds
  - c) Managing information flow to the subsystems
3. Suki is revising her school notes while she is listening to the television. She is finding revising difficult. Which component of the working memory is Suki overloading?
  - a) The central executive
  - b) The visuospatial sketchpad
  - c) The phonological loop
4. Which researcher found separate components of the visuospatial sketchpad?
  - a) Lieberman
  - b) Darling et al.
  - c) Sebastián and Hernández-Gil
5. Dual processing tasks support the idea that working memory has separate components to process verbal and visual information because ...
  - a) we are able to perform two verbal tasks simultaneously
  - b) we are unable to process two verbal tasks simultaneously
  - c) we are unable to process one verbal task and one visual task simultaneously

**SKILLS**

ANALYSIS, COMMUNICATION,  
CRITICAL THINKING,  
INTERPRETATION, REASONING

**EXAM PRACTICE**

1. Nico is a library assistant working at a busy library. A visitor to the library asks Nico about the location of a few particular books that they are interested in reading. At the same time, Nico overhears a conversation that his library manager is having about a different book with another visitor. Nico goes to search for the books for the visitor, but as he begins to search, he has forgotten the names of some of the books he is looking for.
  - a) Describe, using the phonological loop, why Nico could not remember all of the books the visitor wanted. (2 marks)
  - b) Explain one strength of using the working memory model (Baddeley and Hitch, 1974) to explain why Nico could not remember the books that the visitor wanted to read. (2 marks)



# CHAPTER 10

## MEMORY: RECONSTRUCTIVE MEMORY

### LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand Bartlett's (1932) study of reconstructive memory
- understand schema theory
- evaluate reconstructive memory.

### GETTING STARTED

Read the following passage of text once.

'When the man entered the kitchen, he slipped on a wet spot and dropped the delicate glass pitcher on the floor. The pitcher was very expensive and everyone watched the event in horror.'

(Bransford, 1979)

Now cover the passage and recount the text as carefully as possible.

Compare your recount to the original passage. Are there any differences?

Typically, people recall that the glass smashed, which is unsurprising given the context of the short story. Bartlett's reconstructive memory can explain this as the story was stored in memory, but when you came to recall the story, you used your imagination to reconstruct it. This will be discussed in more detail through this chapter.



▲ Sir Frederic C. Bartlett (1886–1969)

### RECONSTRUCTIVE MEMORY (BARTLETT, 1932)

Sir Frederic C. Bartlett (1886–1969) was one of the most influential cognitive psychologists of the last century; his most notable contribution was a collection of memory experiments published in his book *Remembering*. Contrary to much experimental research at the time, Bartlett insisted on representing memory in a real context. He stated that experiments should not just capture reactions, they should capture human beings. Bartlett believed that memory should not be divided into its constituent parts and treated as independent from other functioning, but rather should be studied in a special way to capture the relationship between memory and other cognitive processes.

Based on the numerous experiments he conducted, Bartlett proposed a theory of **reconstructive memory**. Rather than viewing memory as a passive and faithful record of what was experienced, he viewed memory as reconstructive in nature. He proposed that when we experience an event, we record it in memory like a series of notes on a notepad. When we come to remember the event, we return to those notes and actively try to make sense of them. We have to use our previously stored knowledge to make sense of the 'notes'; in doing so we may add, reinterpret, fill in the gaps and transform them into a coherent story. It is an imaginative reconstruction of events, which can mean that the original event is distorted as we remember it. Bartlett drew on the concept of schema to explain this.

### KEY TERM

**reconstructive memory:** the idea that we alter information we have stored when we recall it, based on prior expectations/knowledge

### SCHEMA THEORY

Schemas are parcels of previously stored knowledge or a mental representation of information about a specific event or object. Our schemas are developed through our own personal experiences, some of which may be similar to others while some are different, and these are used to interpret and predict events in the world. We draw on our schema when we recall an event to fill in the gaps and make sense of the stored notes. This means that recall is an active reconstruction of an event strongly influenced by previously stored knowledge, expectations and beliefs. Bartlett suggested that memory is prone to distortion because people use their schema to reconstruct past events.



Schema influence memory when an event is perceived and stored, and also when it is recalled or retrieved from memory. For example, as we experience an event, we tend to store things which are consistent with our schema and ignore/fail to store or even change what is not consistent with our schema. Schema can also influence how we remember an event as we use our schema to reinterpret the mental notes we have taken as we retrieve them.

**SKILLS**

COMMUNICATION, ANALYSIS,  
CRITICAL THINKING

**ACTIVITY 1**

Investigate how schema influence recall by activating schema for 'age' to see if it affects recall of an image. For example, the image can be a person, and you can activate 'age' schema by asking participants to recall how 'old' or how 'young' the person in the image was. Participants asked how old the person was should recall them as being older than those asked how young the person was.

**WIDER ISSUES AND DEBATES****Nature–nurture**

Schemas are mental constructs that form the structural or hardware components of the human memory system and can be inferred to be biological structures or containment units (modules). However, the way in which schemas represent knowledge will vary between individuals and certainly across cultures. Because schemas represent stereotypical beliefs about an object or event, these will be affected by upbringing and so they are a product of nurture.

**SKILLS**

CREATIVITY, PROBLEM SOLVING,  
DECISION MAKING, ADAPTIVE  
LEARNING

**ACTIVITY 2**

Schema theory has been applied to the field of education to encourage learning and recall. Activating prior knowledge before teaching a topic can establish a schema to help students learn more effectively by bridging the gap between existing knowledge and the information they are trying to learn. Teachers can also aid learning by relating topic content to real-life experiences or personal schemas to make information more memorable.

Using this information, design a lesson that could be used to promote these strategies with students trying to learn the geography of their local area.

**EVALUATION OF RECONSTRUCTIVE MEMORY**

Bartlett based much of his research on story and object recall, one of which was recall of a Native American folktale called the 'War of the Ghosts', a story deliberately selected for its cultural unfamiliarity to British participants. He found that participants' recall of the story was shorter than the original with omissions and changes made to the narrative to make it culturally more familiar. The story had been transformed to a coherent, culturally meaningful story for the British participants. This study will be discussed in further detail on pages 130–31.

Brewer and Treyens (1981) asked participants to recall items from an office where they had been waiting. Some objects were consistent with what would be expected in an office, such as a lamp, and some objects in the office were inconsistent with what would be expected, such as a skull. They found that participants were more likely to recall objects consistent with what would be expected in an office, but participants also recalled objects that were consistent with an office but were not actually there. Participants were drawing upon their office schema to recall objects, offering evidence for schema theory.

An important application of reconstructive memory has been in the field of eyewitness testimony. An eyewitness is a source of evidence about a criminal event which they have witnessed, and this evidence may be used in court to convict or defend a suspect. If memory is reconstructive, we should be cautious when relying on eyewitness testimony in court.



**THINKING LIKE A PSYCHOLOGIST**

The reliability of eyewitness testimony has been questioned for some time. The Innocence Project is a foundation which has been working to exonerate victims of false imprisonment based on mistaken eyewitness testimony and identification. Find out more about the Innocence Project, the work they do and the cases they have aided.

A criticism levelled at Bartlett is the overstatement of memory as inaccurate and flawed. This has led to a wealth of experimental research to demonstrate that people are unreliable when recalling witnessed events. However, Mark Steyvers and Pernille Hemmer (2012) argue that the experimental conditions of Bartlett's research deliberately induce errors in recall, leading to the view that memory is unreliable. Their research demonstrates that in a real context without manipulated material, recall can be very accurate. Therefore, we should be cautious when assuming that memory is completely unreliable, particularly in familiar settings. Some memories are more resistant to distortion than others, and this can vary among different individuals and different situations. This makes it difficult to precisely predict what will be reconstructed and how. Much research into reconstructive memory is laboratory based, so in a real-life situation it may be difficult to determine the accuracy of recall or the extent of memory distortion because we cannot verify how a real-life event actually happened.

It has also been argued that reconstructive memory is not a complete explanation of memory as it suggests that memories are part traces (the actual information encoded at the time of the event) and partly the result of the reconstruction process, with both influenced by schemas. However, compared to other theories of memory it is vague on the actual processes involved, and fails to explain how memory is reconstructed at the point of recall. This makes it a partial explanation of memory processing.

**SKILLS**

**CRITICAL THINKING, ANALYSIS,  
REASONING, DECISION MAKING**

During your study of this topic you will have opportunities to apply your knowledge to different contexts. In Paper 4 you will also be asked to use your knowledge of the topics and approaches to discuss a key question of relevance to society. You will be given a key question and some background information to help you apply your knowledge of concepts, theories and research to explain the key question. You should also consider other plausible explanations and develop a for and against argument for the key question you have been given.

**ACTIVITY 3**

One key question of relevance to society is whether we can trust eyewitness testimony.

Eyewitness testimony is the description given of a criminal event by people who have witnessed it. This may also involve suspect identification using a line up or photofit. Witnesses may misreport or misidentify, resulting in false testimony being reported. There have been cases of people who have been falsely accused of a crime based on false eyewitness testimony. These people have spent considerable time in prison before being exonerated. One notable case is Ronald Cotton, who was misidentified by his victim and sentenced to life in prison. Ronald spent more than ten years in prison before he was exonerated because the police found DNA evidence from the actual offender.

Michelle Tuckey and Neil Brewer (2003) asked 234 students what they thought were common elements of a bank robbery (e.g. the robbers left with the money). This information was used to establish the students' schema of a bank robbery. The students watched video footage of a bank robbery and were asked to recall everything about the robbery three days, three weeks and three months later. The researchers found that witnesses appeared to modify schema inconsistent information from the video (the robbers were wearing suits) to be schema consistent (the robbers left in a car) in at least one interview.

Zhu et al. (2012) showed participants a series of pictures of an incident involving someone stealing a wallet. The pictures were followed by descriptions of the event, which were either accurate or inaccurate about the pictures. Participants were then asked to recall the pictures. Zhu et al. found that the inaccurate information in the descriptions of each picture became incorporated into the participants' recall.

Discuss the key question of whether we can trust eyewitness testimony. You should use concepts, theories and/or research studied in your psychology course.



**CHECKPOINT**

1. Which of these is a characteristic of reconstructive memory?
  - a) Memories are stored as exact copies of what happened.
  - b) Memories are not changed.
  - c) Memories are prone to distortion and change.
2. Schemas are:
  - a) short-term memories which are rehearsed.
  - b) photographic memories which are recalled exactly.
  - c) mental constructs used to perceive and recall information.
3. In Bartlett's 'War of the Ghosts', what did participants do when recalling the story?
  - a) Accurately recall all the details of the story
  - b) Change the story to make it familiar
  - c) Forgot the story completely
4. What does reconstructive memory suggest about eyewitness testimony?
  - a) Witnesses can be unreliable when recalling events.
  - b) Witnesses can be trusted to give an accurate account.
  - c) Witnesses have photographic recall of events.
5. What is one weakness of reconstructive memory?
  - a) It presents an overly pessimistic view of memory as unreliable.
  - b) It tells us that memory is reconstructive.
  - c) There is lots of experimental evidence to support the theory.

**EXAM TIP**

You may be asked to explain why an individual recalled an event differently from what actually happened or explain why different people recalled an event in a different way. In each case it is important to apply your knowledge of reconstructive memory and schema theory to the scenario by referring to specific details about the scenario.

**Example:**

Maryam was witness to a shoplifting incident at her local shop. She reported to the interviewing police officer that the shoplifter had stolen high-value items including coffee and hair products. When viewing the closed-circuit television footage, the police noted that the shoplifter had actually stolen low-value items: frozen peas, tinned beans and toothpaste.

Explain, using reconstructive memory, why Maryam may have reported the incident inaccurately.

It is important to refer to the details of the event such as:

- shoplifting
- reporting high-value items stolen, including coffee and hair products
- closed-circuit television footage of low-value items stolen, such as frozen peas and tinned beans.



## SKILLS

ANALYSIS, COMMUNICATION,  
CRITICAL THINKING,  
INTERPRETATION, REASONING

## EXAM PRACTICE

1. Aisyah and Fatimah witnessed a thief stealing a woman's handbag in the street. They were both asked to describe the thief to the police at the police station. Aisyah told the police that the man was older, had dark hair and was wearing a dark hooded jacket. Fatimah told the police that the man was younger, had blond hair and was wearing jeans and a sports jumper.
  - a) Explain, using reconstructive memory (Bartlett, 1932), including schema theory, why Aisyah and Fatimah gave different descriptions of the thief to the police. (3 marks)
  - b) Explain one strength of using reconstructive memory (Bartlett, 1932), including schema theory, to explain why Aisyah and Fatimah may have recalled the thief differently. (2 marks)
2. Rabina has been suffering with memory problems that cause her to become confused. She is not always able to understand situations and becomes frustrated with herself and other people. Rabina was questioned by police on two previous occasions for antisocial behaviour. She was also found by police roaming around in the early hours of the morning looking confused and disorientated and unable to find her way home. Recently Rabina got into an argument with a man who she thought was laughing at her. When the police arrived, the man said he was not laughing at Rabina, but Rabina told the police that the man was lying. The police interviewed Rabina but she struggled to remember exactly what had happened. The police requested a doctor to examine Rabina. The doctor decided to refer her for a brain scan for memory processing issues. Discuss how well knowledge from cognitive psychology could explain Rabina's memory issues. (8 marks)



# CHAPTER 11 METHODS: DESIGNING AND CONDUCTING EXPERIMENTS

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- design and conduct experiments, including field and laboratory experiments
- understand hypothesis construction and variables
- understand experimental research designs
- recognise problems that arise when conducting experiments
- understand the controls that can be used to ensure reliable and valid research findings.

## GETTING STARTED

During this topic we have explored many different types of experiments used to investigate memory. Make a list of some of these experiments, describing the procedures and apparatus used, and the aspects of memory they were testing. In small groups, discuss the different ways of investigating memory and how useful they have been at explaining memory.

## KEY TERMS

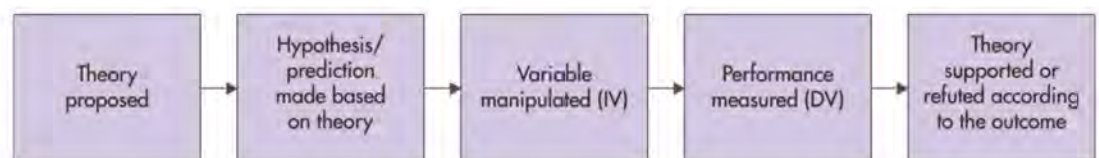
**field experiment:** a piece of research that takes place in the setting where the behaviour being studied would naturally occur

**laboratory experiment:** an experiment conducted in a controlled environment

## EXPERIMENTS AND EXPERIMENTAL DESIGN

Memory is difficult to observe or accurately measure using a self-report method, so cognitive psychologists often use experiments to objectively quantify the capacity and duration of each memory store. Traditionally **laboratory experiments** have been used to investigate memory, but increasingly **field experiments** are being used to understand memory in more everyday contexts.

Experiments are investigations where a variable is manipulated or altered and its effect measured, while maintaining control over other variables that might interfere with this situation (see Figure 11.1). Experiments 'set up' a situation where participants are required to perform a task and the performance of this task is measured. The extent to which this task reflects real life or is conducted in a realistic situation depends on the type of experiment being conducted.



► Figure 11.1 The experimental method

## AIM

The aim of an experiment is a general statement about what area or topic is being researched. An aim typically begins with 'To investigate...'. The aim is a concise and to-the-point statement that directs the overall ambition of the study.

## Example aims

- To investigate whether the type of food given to cats affects their purring.
- To investigate whether praise affects the time children spend tidying away their toys after playing with them.



## KEY TERM

**operationalisation:** defining the variables specifically so that they are directly tested

## EXAM TIP

The aim is an important part of a research investigation because it clearly signposts the topic being investigated. An aim should be as clear and precise as a hypothesis. Once you have read about hypotheses and **operationalisation** later in this topic, it is important that you apply the same detail and accuracy to an aim.

## KEY TERMS

**alternative hypothesis:** a prediction of the outcome of a study when conducting a study using a non-experimental method

**experimental hypothesis:** a prediction of the outcome of a study when conducting an experiment

**non-directional (two-tailed) hypothesis:** a non-directional hypothesis predicts that a difference or relationship will be found, but not the direction that the difference or relationship will take

## HYPOTHESES

Experiments begin with a prediction of what is likely to happen in the investigation based on previous knowledge, research or theory. This prediction of a likely outcome is known as the **alternative/experimental hypothesis**. An alternative/experimental hypothesis is a clear and precise statement predicting the results of the study.

Sometimes we can be certain of the outcome of an experiment because, perhaps, there is strong evidence to suggest the outcome may happen, or it is based on a robust theory. In such cases a directional (one-tailed) hypothesis will be predicted. When we are not certain of the outcome of an experiment, because there are conflicting theories or a lack of relevant evidence, a **non-directional (two-tailed) hypothesis** will be predicted. A non-directional hypothesis predicts that a difference or relationship will be found, but not the direction that the difference or relationship will take. (See Figure 11.2.)

## Examples of hypotheses

Directional/one-tailed hypothesis:

- Cats will purr for longer when they are fed tinned food compared to dry food.
- Children will spend longer washing dishes the more praise they receive.

Non-directional/two-tailed hypothesis:

- There will be a difference in the length of time a cat purrs when given tinned and dry food.
- Praise will affect the time children spend tidying away their toys after they have finished playing with them.

## Directional or one-tailed



The direction of the results can be predicted.

## Non-directional or two-tailed



A change or difference is predicted, but not the direction it will go in.

▲ Figure 11.2 Differences between hypotheses

## SKILLS

COMMUNICATION, ANALYSIS,  
CRITICAL THINKING

## ACTIVITY 1

When getting started you considered some of the memory experiments discussed in this topic. Look again at these experiments and propose a hypothesis that each experiment would have used. In pairs, discuss whether the researcher would have proposed a directional (one-tailed) or non-directional (two-tailed) hypothesis for their experiment.

## KEY TERM

**null hypothesis:** predicts no difference/relationship will be found or that any difference/relationship is due to chance factors

A **null hypothesis** is a default prediction that is supported if there is a greater likelihood of the results occurring by chance. When we conduct research, we often find some difference or relationship; it is rare we would find nothing, but sometimes the difference or relationship found is too small or insignificant to be due to anything other than chance variation. For example, if we are investigating whether praise affects a child's inclination to tidy their bedroom, it is unlikely that we will find no/zero effect of praise on bedroom tidying. However, the change observed in bedroom tidying may not be great enough to be due to praise alone and could be due to chance.



### Examples of null hypotheses

- There will be no difference in the length of time cats spend purring when fed tinned or dry food. Any difference found will be due to chance factors.
- There will be no effect of praise on the time children spend tidying away their toys after playing with them. Any effect found will be due to chance factors.

### INDEPENDENT AND DEPENDENT VARIABLES

An experiment always has an independent variable and dependent variable. The independent variable (IV) is the variable that is manipulated or changed by the researcher in order to demonstrate a difference between the experimental conditions. The dependent variable (DV) is the variable that is measured or the result of the experiment. The dependent variable measures any changes that occur because of the independent variable. This allows causality to be established (cause and effect).

### Examples of IVs and DVs

'A researcher wished to investigate whether participants will recall more words from an organised list compared to a random list.'

In this example, the researcher will have to change which list participants have to learn and recall from. This is manipulated by giving one set of randomised words and one set of organised words. The type of word list is the IV.

The researcher will then ask participants to recall the list of words and record how many words they remember correctly. This is the measured variable or outcome of the investigation, so is referred to as the DV.

### OPERATIONALISATION

Once the IV and DV have been decided, it is very important to make these variables precise and specific by operationalising them so they are testable. This means deciding exactly how you are going to manipulate the IV and exactly how the DV will be recorded. Operationalisation of the IV and DV means that the study can be precisely replicated to check the conclusions are reliable. **Operational definitions** of the DV can increase objectivity in research; this is because the outcome is measured in the same way by all researchers, and the outcome is not open to interpretation. It also means that other psychologists can assess whether or not the researcher has conducted valid research.

### Good and poor operationalisation

#### Poor operationalisation

A researcher thought that children who came to school without a healthy breakfast had problems during morning lessons. The researcher decided to ask the children what they had for breakfast and split them into healthy and unhealthy breakfast groups. She then watched them read a book and decided how well they could read.

This is an example of poor operationalisation because the way in which the healthy and unhealthy breakfast groups are defined is unclear. It is also not clear how the researcher measured reading skill. A study such as this example would be difficult to replicate exactly to check for reliable findings. If more than one researcher was involved in the research, it would not be clear what is meant by reading skill, so they may reach different conclusions for the same child. A different researcher would not be able to assess how healthy breakfasts were defined or how reading skill was defined, so could not be certain that the study was valid.

#### KEY TERM

**operational definitions:**  
what the variables are and  
how they are measured





▲ Does a healthy breakfast help children to concentrate at school?

### KEY TERMS

**confounding variable:** a variable that affects the findings of a study directly, so that the study is no longer measuring what was intended

**extraneous variable:** a variable that may have affected the dependent variable but that was not the independent variable

### EXAM TIP

It is only necessary to control those variables that might have an unwanted impact on the dependent variable. For example, controlling the temperature of a room is not vital unless you are testing something where the temperature might affect performance. So, it is important to consider the nature of the psychological research being undertaken before deciding which variables need controlling.

### Good operationalisation

A researcher thought that children who came to school without a healthy breakfast had problems during morning lessons. The researcher asked the children and parents to make a record of what they ate for breakfast over the course of a week. A nutritionist was asked to categorise the breakfasts as healthy and unhealthy. Breakfasts with over the recommended meal allowance for salt, fat and sugar were defined as unhealthy. The researcher then timed how long a child took to read a story during literacy hour. All children read the same story out loud to the researcher, who timed the children and recorded any errors they made.

This is an example of good operationalisation because the IV (healthy and unhealthy breakfasts) are clearly defined and the DV (reading speed and errors) can be measured exactly without any ambiguity. This study is replicable, and it would be easy for a different researcher to assess whether the definition of healthy and unhealthy breakfasts and reading ability were measuring what was intended.

## EXPERIMENTAL VARIABLES

### EXTRANEOUS AND CONFOUNDING VARIABLES

An experiment should try to establish control over factors that may have an unwanted effect on the dependent variable. These other variables are known as **extraneous variables**. Sometimes an extraneous variable can influence the dependent variable and make it look as though the effect was from the independent variable; this is called a **confounding variable**. This variable confounds the results of the study in such a way that you are no longer measuring the effect of the IV on the DV.

Extraneous and confounding variables can be divided into two types: situational variables and participant variables.

#### Situational variables

An extraneous variable that might affect the results of a study could be found in the environment in which the study is conducted. Situational factors such as lighting, noise, temperature, other people, disturbances and time of day, may all affect the results of a study so should be controlled or eliminated. Controlling extraneous variables means that they are held constant for all participants, so that the variable affects everyone equally. Eliminating extraneous variables involves removing the possibility of them occurring in the first place.

#### Participant variables

Participants themselves may affect the results of the study. Participants may bring different characteristics to an experiment that could have an effect on the dependent variable, such as level of motivation, personality, intelligence, experience, age and skills. It is fairly easy to control participant variables such as age and gender, but controlling motivation or experience may take more thought.



## SKILLS

CRITICAL THINKING, PROBLEM  
SOLVING, ANALYSIS

## ACTIVITY 2

List some situational and participant variables that could affect the following studies and then consider how you would control or eliminate them.

- An investigation into sporting experience and the ability to shoot a hoop with a basketball at a first attempt.
- An investigation to see if rehearsal was a better memory technique to learn a list of digits than creating a mental picture of the digits.
- An investigation to see if more cars stopped at a crossing on a busy street for men or women.
- An investigation into essay-writing skills of history and art undergraduate students.
- An investigation into tiredness and driving performance.

## EXPERIMENTER EFFECTS

Experimenter or researcher effects refer to the way an experimenter may influence the outcome of an experiment by their actions or mere presence. These may be subtle cues that may influence the way a participant responds in an experimental situation. Sometimes these can be obvious effects, such as a female researcher asking a male participant about his attitudes towards gender equality, or a young researcher asking an older participant what they think about youth culture. However, some experimenter effects are more subtle, such as a nod or smile which affirms a behaviour.

Closely related to this is the concept of **demand characteristics**. This is when participants behave differently from normal because there are clues within the research setting which may lead participants to change their behaviour. They may detect clues about the aims of the study which leads to them behaving as they believe they are expected to. This change in behaviour may threaten the validity of the findings.

## KEY TERM

**demand characteristics:** participant behaviour altered because they may guess the study aim

## EXPERIMENTAL CONTROL

In experiments using human participants, a great many variables can influence outcomes. It is important to be able to identify these variables and then put into place controls to help prevent them having any effect on the experiment. Various different control techniques have been established to help deal with these control issues.

## STANDARDISATION

Standardisation refers to making an experiment the same experience for all participants. Standardised instructions are a set of instructions given to all participants that can be used to eliminate experimenter effects because it removes the potential for the experimenter to give verbal or non-verbal cues to participants. Standardised procedures (such as stages of the experiment, timings, apparatus) ensure that all participants are treated in the same way (other than the change in condition due to the independent variable) so there is no variation in the way they experience the research that may affect the way they behave. Standardisation also improves the replicability of the experiment.

## CONTROL GROUP

A control group is a group of participants who undertake the procedure of an investigation but are not subject to the experimental manipulation. For example, when investigating the effect of memory techniques on learning, one group of participants would be taught memory techniques and then given a learning test, whereas the control group would not be taught



memory techniques but given the same learning test. A control group gives a baseline measure from which to compare the experimental group. Any difference found between the control and experimental groups shows the effect of the independent variable.

### DOUBLE- AND SINGLE-BLIND EXPERIMENTS

To control for demand characteristics, participants may be unaware that they are part of an experiment, or may have been deceived as to the true nature of the study. This is known as a **single-blind procedure**, where the participants are unaware of the study aim so it does not influence how they perform. To eliminate experimenter effects, independent researchers who are not told the aim of the study may be employed by an experimenter to conduct the study on their behalf. If neither the participant nor researcher knows the aim of the study, it is referred to as a **double-blind procedure**.

#### KEY TERMS

**double-blind procedure:** neither the participant nor researcher knows the aim of the study

**matched pairs design:** where different participants are allocated to only one experimental condition (they do not do both) but are matched on important characteristics

**participant variables:** natural variation in human characteristics

**repeated measures design:** where all participants complete all conditions of the experiment

**single-blind procedure:** to control for demand characteristics, participants may be unaware that they are part of an experiment, or may have been deceived as to the true nature of the study

### IDENTIFYING LEVELS OF THE IV AND CONDITIONS OF THE EXPERIMENT

For example, this might be: the effect of music (IV) on transcription speed and accuracy (DV).

Levels of the IV: Traditional music or silence.

Conditions of the experiment: Whether participants hear traditional music while trying to transcribe verbally dictated information or transcribe in silence.

The conditions of the experiment reflect directly the levels of the independent variable. More levels of the IV can be added, for example, classical music or popular music and therefore there will be more conditions involved in the experiment.

Note: Often one level of the independent variable is a control group, which receives no treatment. In the above example, the control group is the group that transcribes in silence. It is important to have a control group as a baseline comparison to determine the effect of the IV on the DV.

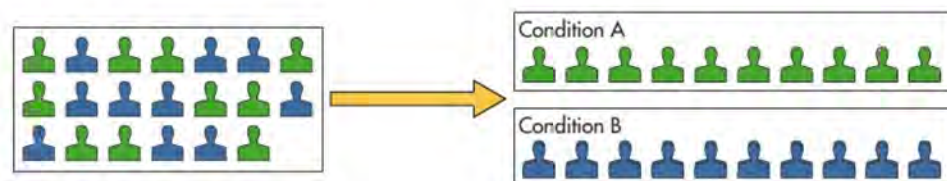
Participants recruited to take part will need to be allocated to one or both conditions of the experiment. There are several designs that can be used to achieve this: an independent groups design, a **repeated measures design** and a **matched pairs design**.

### EXPERIMENTAL DESIGN

Once the independent variable has been operationally defined, the levels of the independent variable can be identified, and the conditions of the experiment established.

### INDEPENDENT GROUPS DESIGN

Independent groups design is when the participants are divided into different groups and are only involved in one of the experimental conditions of the experiment (see Figure 11.3). One of these groups may be a control group which receive no experimental manipulation. A strength of this experimental design is that participants are less likely to guess the aim of the investigation as they only take part in one level of the independent variable, so they do not get to know about the other conditions. This means that the chance of demand characteristics or expectancy effects is somewhat reduced. However, it does mean recruiting twice as many participants because you need separate groups and there may be individual differences or **participant variables** between the participants in each group that make a comparison of the groups unreliable.



► Figure 11.3 Independent groups design



## KEY TERMS

**counterbalancing:** alternating the conditions of the study for each participant in a repeated measures design

**order effects:** the problem with presentation order of stimulus material. Participants may become practised at the test so improve performance or they may become tired so that performance deteriorates

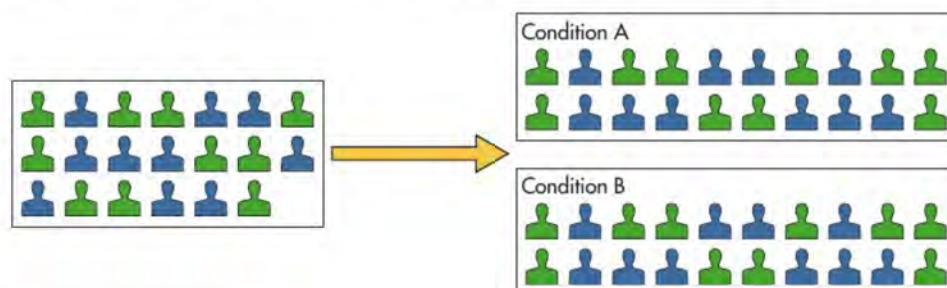
**random allocation:** participants are allocated to a condition of the study at random (names drawn from a hat)

One way of controlling for individual differences is to randomly allocate participants to one or other of the conditions. **Random allocation** means that it is probable, but not certain, that there will be an even distribution of participant variation because they all have an equal chance of being selected for each condition of the experiment. Another strength of using an independent groups design is that it avoids **order effects**, such as practice and fatigue, which are associated with using the same participants twice.

## REPEATED MEASURES DESIGN

Repeated measures design is when all participants take part in all conditions of the experiment (see Figure 11.4). This resolves the problem of individual differences because the same participants are in all levels of the independent variable, so the participant's results in one condition are compared to the same participant results in a different condition. Fewer participants are needed for a repeated measures design, because they are used twice, so it is more economical than an independent groups design. However, the chance of participants displaying demand characteristics is greatly increased because they have knowledge of all conditions of the study, and are therefore more likely to be able to guess the aim of the study. There is also a problem of order effects; this is when the performance of participants in one condition is influenced by the previous condition of the experiment. Order effects include practice and fatigue; a participant may learn the task in the first condition so perform better in a second condition, or become tired and so performance declines in a second condition.

One way of controlling for the effect of demand characteristics is to use a single-blind technique. To control for order effects, **counterbalancing** can be used to ensure that participants experience the conditions in a different order. Counterbalancing involves half the participants being placed into Condition A first then Condition B second, while the remaining half does Condition B then Condition A. This means that practice or fatigue effects are distributed equally to affect both condition A and condition B, balancing them out.



► Figure 11.4 Repeated measures design

## MATCHED PAIRS DESIGN

To overcome the problems associated with repeated measures and independent groups designs, a matched pairs design can be used. This is when different participants are assigned to each condition of the experiment (similar to independent groups) but they are matched on characteristics important to the study. These characteristics are often established by pre-testing and researching the lives and backgrounds of all the participants. This control ensures that the participants in each condition can be compared fairly. It is important to match participants on characteristics central to the aim of the study. It would not be useful to match participants on hair colour, for example, in a study of driving ability; the matching would have to concern driving experience, eyesight, reaction time or other characteristics where any variation could affect the results.

A matched pairs design ensures that the conditions can be compared more reliably and that any difference found between the results of each condition is more likely to be due to the manipulated variable, so causation can be established. However, a matched pairs design is time-consuming and many participants have to be excluded from the study because they do not meet the matching criteria. It is also very difficult to match participants on all possible



characteristics that could have an effect on the dependent variable. For example, if a study was conducted into the effect of an unhealthy breakfast on reading ability, it would be useful to match participants' educational level and eyesight. However, there may be variables that are much more difficult to match, such as how many books a child has at home, the educational level of parents and how much time parents spend reading with their children. Therefore, a matched pairs design cannot be truly matched on all possible variables.

## RELIABILITY, VALIDITY AND OBJECTIVITY

Think about reliability and validity by considering the speedometer of a car (Figure 11.5).

The speedometer is designed to tell you exactly what speed you are going. If the speedometer tells you that you are travelling 30 km/h when you are actually travelling 20 km/h, it gives you

an invalid measure of speed. If it continues to overestimate your speed by 10 km/h it may be invalid, but it is consistent; this means that it is reliable. In research, this also can occur if your measuring tool is inaccurate but consistently so.

Now consider your speedometer telling you that you are travelling 30 km/h when you are travelling 20 km/h one day, but the next day it tells you that your speed is 40 km/h when you are travelling 20 km/h. If your speedometer is inconsistent, it is not only unreliable, but it is likely to be invalid (at least on most occasions).

### RELIABILITY

Reliability refers to the consistency of findings from research, and it is an important criterion for being scientific. For experiments, test-retest reliability is important.



▲ Figure 11.5 Car speedometers must be set to never under-report a vehicle's speed but they may over-report in some instances.

### Test-retest reliability

If findings are consistent, and can be considered reliable, we can trust that the finding will happen again and again. In order to achieve reliability, research must be replicable. This requires very tight control of extraneous variables that, if not controlled, could result in different findings when a study is repeated.

### Inter-rater reliability

**Inter-rater reliability** is when the scoring of one researcher is compared to another researcher as a measure of consistency or agreement between them when conducting an observation, scoring data or taking measurements. The scores produced by the different researchers are correlated to indicate the rate of agreement between them. This can control for subjectivity, or differences in opinion, between different researchers which could lead to unreliable data.

### VALIDITY

Validity refers to whether the study is measuring the behaviour or construct it intends to measure. Understanding validity is an important skill for both designing and evaluating research studies. **Internal validity** refers to how well the procedure of a study establishes a causal relationship between the manipulated independent variable and the measured dependent variable, or whether it has been confounded by uncontrolled extraneous variables. Internal validity can be ensured by using standardised procedures, controlling for order effects and individual differences, and avoiding demand characteristics. A way of assessing internal validity is through predictive validity: the extent to which the performance being measured can predict

### KEY TERMS

**internal validity:** the extent to which the outcome of the study is the direct result of the manipulated independent variable

**inter-rater reliability:** the degree of agreement and consistency between raters about the thing being measured



future performance on a similar criterion. For example, if a test of intelligence can accurately predict future academic success, then it has predictive validity.

### Ecological validity

Ecological validity refers to the extent to which the research can be generalised to other situations, for example real life or everyday situations. Memory experiments conducted using artificial tasks, such as recalling meaningless lists of words or trigrams, may not be generalised to everyday use of memory. This means that the study results may not tell us anything useful about how we use our memory day to day. Laboratory experiments can lack ecological validity because participants are also often aware of being studied, so will change their behaviour and act in an unnatural way. This means that the behaviour studied may not reflect behaviour in an everyday setting.

### OBJECTIVITY

Being objective refers to the need to be impartial and judgement free. It is important that the dependent variable is measured objectively, so that the opinions or judgements of the researcher do not affect how the dependent variable is recorded. For example, imagine that you are asked to guess the length of a table. Your judgement will be based on your own opinion or belief about length and will probably differ from the guesses of others. Your guesses and those of others are subjective and therefore unlikely to be either reliable or valid. However, if you use a ruler to measure the length of the table, your recorded answer is objective, and will be exactly the same as others who measure the same table using the same ruler. This is an objective measure of the table length, and therefore will be both reliable and valid.

Cognitive psychology studies concepts, such as memory, that cannot be directly observed and measured. Cognitive psychologists would agree that we cannot objectively measure mental processes, but we can objectively observe the data produced by experiments and neuroimaging techniques. If we conduct a short-term memory test that records a participant recall of five words, this is an objective measurement of the capacity of short-term memory. If we use a PET scan to test brain functioning during a memory experiment, we can objectively observe regions of the brain that are active during the task.

### SKILLS

COMMUNICATION, CRITICAL  
THINKING, ANALYSIS, REASONING

### ACTIVITY 3

Using the studies and theories you have learned about, write a summary of the research (aim, procedure, results and conclusions) on a small card. Then rate the study/theory on a scale of 1 to 10 for reliability, validity and objectivity.

## CONDUCTING LABORATORY AND FIELD EXPERIMENTS

### LABORATORY EXPERIMENTS

A laboratory experiment is conducted in an artificial environment where an independent variable is manipulated and its effect on the dependent variable measured in some way. Taking participants away from their natural environment eliminates the potential for extraneous variables affecting their behaviour. Exposing the objective truth by stripping away the context ensures a human characteristic can be studied in an objective and value-free way. An artificial context provides the researcher with the level of control over relevant variables necessary to achieve a more scientific approach and ensure **causality**.

However, laboratory experiments can be criticised for lacking ecological validity as behaviour is measured in an artificial environment and in an artificial way. This makes the findings of laboratory research unlike normal life so they may not apply to a real-life situation. Participants are often invited to take part in laboratory research, so they are aware of their participation

### KEY TERM

**causality:** the effect of the manipulated variable on the measured variable can be reliably established as a cause-and-effect relationship



which can lead to demand characteristics and expectancy effects. The presence of the researcher during the experiment may influence the behaviour or performance of participants, so experimenter effects are more likely to have an influence on the results.

### WIDER ISSUES AND DEBATES

#### Psychology as a science

The laboratory experiment is considered to be the most scientific of the research methods that psychologists can use. It is characterised by a high level of control and standardisation. This means that the study can be repeated to check the findings are consistent. As such, laboratory experiments are highly reliable. However, they may lack validity because they do not reflect real-life behaviour.

### FIELD EXPERIMENTS

A field experiment is conducted in a natural environment where the independent variable is manipulated and the dependent variable measured. Participants are tested where they would normally display the behaviour being studied; this may be a classroom, supermarket or high street, and they may not be aware that they are taking part in an experiment. This means that field experiments can have greater ecological validity as participant behaviour will be more natural and the environment in which they are tested is more realistic. If participants are unaware of their participation in the experiment, they will not show demand characteristics. However, because the research is not conducted in a controlled environment, there is a greater chance of extraneous variables having an effect on the dependent variable. There may also be ethical problems if a participant is unaware that they are taking part, as they have not given consent and do not have a right to withdraw from the experiment. In such cases, the experimenter may choose to debrief them after the experiment and offer them the right to withdraw their data from the study.

### CHECKPOINT

1. Which experimental/research design is being described in the following investigations?
  - a) An investigation to see if boys or girls are better at cognitive tasks.
  - b) A digit span test to see if participants recall is better in the morning compared to their recall in the afternoon.
  - c) Researchers investigated the difference in memory ability between identical twins.
2. Lorenzo investigated memory recall in different age groups. Participants were grouped into two age ranges: 20–30 years old and 60–70 years old. Lorenzo read each group a short story three times and then asked each group to recount the story by writing it down. The short story contained 50 words, so Lorenzo scored each participant's recount of the story by how many correct words they recalled.
  - a) Write a directional (one-tailed) experimental hypothesis for this example:
  - b) Now write a non-directional (two-tailed) hypothesis and a null hypothesis for the same example.
3. Identify which of the following are participant variables and which are situational variables:

noise

motivation

gender

distractions



## SKILLS

ANALYSIS, COMMUNICATION,  
CRITICAL THINKING, PROBLEM  
SOLVING, REASONING

## EXAM PRACTICE

1. Zikri was investigating working memory and set up an experiment to test the difference between participants performing a single cognitive task and a dual task. Zikri recruited ten friends to perform a single cognitive task, and ten classmates to perform the dual task, which involved the same cognitive task while they were also learning a list of words. Zikri timed how long it took each group to perform the tasks.
  - a) Explain how one participant variable could have affected Zikri's investigation. (2 marks)
  - b) Zikri wanted to change the investigation to increase the ecological validity of the study. Zikri decided to conduct a field experiment to test dual processing. Describe a task that Zikri could use to test dual processing in memory in this field experiment. (2 marks)
  - c) Explain two weaknesses of Zikri using a field experiment to investigate short-term memory. (4 marks)
2. Zara and Aiden developed a new memory technique to help students with their revision. They put up posters around their university, advertising for volunteers. The volunteer students were given a word list to learn and their recall was recorded. They were then asked to practise the new memory technique for two weeks. After the two weeks they were given a different word list to learn and their recall was measured. The difference in recall before and after learning the memory technique was compared.
  - a) Describe one control that Zara and Aiden would have considered when designing the word lists for this study. (2 marks)
  - b) Zara and Aiden randomised the word lists. Explain how they did this. (2 marks)
3. Noorie investigated encoding in short-term memory using a volunteer sample of 20 participants. Each participant took part in Condition A and Condition B. Condition A involved participants learning ten acoustically similar sounding words, such as cat, hat, bat. Condition B involved the same participants learning ten acoustically different sounding words, such as pen, dog, mat. Noorie recorded how many words the participants correctly recalled from each list.
  - a) Explain one strength of Noorie using a repeated measures design in her experiment into short-term memory encoding. (2 marks)
  - b) Explain one weakness of Noorie using a repeated measures design in her experiment into short-term memory encoding. (2 marks)
  - c) Explain how Noorie could have used counterbalancing in her study of encoding in short-term memory. (2 marks)



# CHAPTER 12

## METHODS: DATA ANALYSIS AND CASE STUDIES OF BRAIN DAMAGED PATIENTS

### LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand decision making and interpretation of inferential statistics
- understand probability and levels of significance ( $p \leq .10$   $p \leq .05$   $p \leq .01$ )
- understand levels of measurement
- be able to calculate the Wilcoxon signed ranks test of difference
- understand observed (calculated) and critical values
- understand sense checking of data
- understand one- and two-tailed testing
- identify type I and type II errors
- know case studies of brain-damaged patients related to memory research, including the case of Henry Molaison (HM).

### GETTING STARTED

Inferential testing goes beyond describing a data set using measures of central tendency and dispersion. Instead we are inferring something about the data, specifically whether the data found could be due to chance factors or whether there is a genuine difference or relationship occurring. This can be more easily demonstrated by a simple coin tossing exercise. In pairs, toss a coin ten times and record whether it lands on one side (heads) or the other side (tails). If you were to predict how many times the coin landed on heads, you might have said 50/50, 5 in 10, 1/2 or 0.5, because this would be likely given the probability of it landing on heads or tails. It is entirely probable that you found just that when you tossed the coin ten times. However, you may have tossed 6 heads and 4 tails, and this result would not have been particularly unlikely based on chance.

Now imagine tossing a coin one hundred times. You would expect the same likely outcome of 50/50, 50 in 100, 1/2 or 0.5 based on chance. But what would you think if you tossed one hundred heads? Is this likely due to chance, or is some other factor at play, such as a weighted coin?

When a result becomes less likely to be due to chance, or less probable, then it is likely to be due to some other factor. Inferential tests calculate the likelihood of a result being due to chance or some other factor, such as a manipulated IV.



▲ Probability can be demonstrated by a simple coin tossing activity

### INFERENTIAL STATISTICS

Descriptive statistics, summary tables and graphs describe a data set, but to know whether there was a real effect of the independent variable on the dependent variable an inferential test of significance needs to be carried out. When data differs between two conditions (which it is likely to do as we rarely find no difference at all) we need to establish whether the effect is a real one or simply due to chance variation between the conditions. If there is a real effect we can reject the null hypothesis, but if there was no real effect, we need to accept the null hypothesis. An inferential test of significance will indicate whether we should retain or reject a hypothesis.

Inferential tests rest on the concept of probability. Probability is the likelihood of an event occurring, so the probability of getting heads or tails on a single coin toss is 0.5 (or 50 per cent or one in two). When testing the probability of data we are actually testing the likelihood of the data (or rather difference between the data sets as defined by the independent variable) being



due to random chance factors or something else. We use an inferential test to decide whether to reject or accept the null hypothesis because it tells us whether the results were likely to be due to chance or not.

### MATHS TIP

Statistics and variables are linked when using an inferential test of significance, so it would be useful to refresh your memory on variables and hypotheses before reading this section. Pay particular attention to the types of alternative hypothesis and the null hypothesis.

### LINK

For quantitative data analysis, including calculating measures of central tendency, frequency tables, measures of dispersion (range and standard deviation) and percentages, please see Topic A, Chapter 5.

### PROBABILITY: HOW SMALL IS TOO SMALL?

If the probability of the results is due to chance, we are assuming that the difference between the data is too small to be significant to show a real effect and the null hypothesis would be retained as the study conclusion. The question here is 'how small does the difference have to be to be too small?' In psychology it is generally accepted that the cut-off for making the decision about whether or not to reject the null hypothesis (and therefore make a judgement about whether the results are due to chance or not) is equal to or less than 0.05. This is expressed as  $p \leq .05$ . This means that we accept a 1 in 20 or 5 per cent probability that the results are due to chance. When we conduct an inferential test of significance it tells us whether we meet this 0.05 probability threshold or not. If the probability of the result occurring by chance is equal to or less than 0.05 we reject the null hypothesis. However, if the probability of the result occurring by chance is greater than 0.05, we retain the null hypothesis.

If the inferential test is significant, we can reject the null hypothesis because the likelihood of the result occurring by chance is 5 per cent or less. If the inferential test is not significant, we accept the null hypothesis because the likelihood of the results occurring by chance is greater than 5 per cent.

### MATHS TIP

Notice that nowhere so far is there mention of 'proving' the results. We simply cannot prove the results are true even after conducting a statistical test. We can only claim that the test reasonably supports the alternative hypothesis we are stating, or that we are not confident in our results, so we are retaining the null hypothesis.

### LEVELS OF SIGNIFICANCE AND ERROR

Although  $p \leq .05$  is the accepted level of probability in psychology, if the result of the inferential test is equal to or less than 0.1 ( $p \leq .10$ ) 10 per cent or 1 in 10 probability of the result occurring by chance, it may still be reported and followed up with more research even if the null hypothesis is accepted.

If the results of an investigation have a less than 1 per cent probability ( $p \leq .01$ ) that they were due to chance, they are highly significant and the null hypothesis is rejected.

#### Levels of probability

$p \leq .10$  – the result is equal to or less than 10 per cent likely to be due to chance, so the null hypothesis is retained as the result is not significant.

$p \leq .05$  – the result is equal to or less than 5 per cent likely to be due to chance, so the null is rejected as the result is significant.

$p \leq .01$  – the result is equal to or less than 1 per cent likely to be due to chance, so the null is rejected as the result is highly significant.



### TYPE I AND TYPE II ERRORS

In psychology we generally use a 5 per cent level of probability. Other subjects use different levels of probability. So medical research will generally use a 1 per cent probability level, which is more stringent, while other disciplines use the more lenient 10 per cent probability level. One reason for adopting a level of significance can be based on the risk of making an error. There are two types of error that can occur:

#### KEY TERMS

**type 1/type I error:** when the null hypothesis is rejected and the alternative hypothesis supported when the effect was not real

**type 2/type II error:** when the alternative hypothesis is rejected and the null hypothesis retained when there was actually a real effect

- **Type I error** – this is known as a false positive result, as a researcher rejects the null hypothesis (so accepts the alternative hypothesis) when it is not true. Medical research tries to avoid making a false positive/type I error by adopting the more stringent 1 per cent level of probability. This is because the cost of making a false positive claim (for example, approving an ineffective drug) is too severe. However, it can increase the chance of making a type II error because 1 per cent is very stringent and it could mean that they are missing out on something genuinely occurring.
- **Type II error** – this is a false negative result, as a researcher accepts the null hypothesis (so rejects the alternative hypothesis) when it is not true. In exploratory research there is less cost to making an error, so researchers sometimes adopt a more lenient 10 per cent probability level which increases the likelihood of making a type I error/false positive but may help detect differences when using small sample sizes during initial research. Adopting a 10 per cent probability level also reduces the chance of making a type II error/false negative and therefore avoids missing something important.

It is generally accepted that a 5 per cent probability level is a compromise between making a type I and type II error. So, at a 0.1 level of significance, there is a chance that the alternative hypothesis is accepted when it should not have been. Accepting the alternative hypothesis when the results were really not significant and the null hypothesis should have actually been retained, is known as a type I error. A type I error occurs because the level of significance is too lenient.

However, if we set 0.01 as the accepted level of significance in psychology, we are likely to reject a number of alternative hypotheses when there was a real effect. Retaining the null hypothesis when there was actually a real effect is known as a type II error, and this occurs because the level of significance set is too stringent.

#### SKILLS

REASONING, ANALYSIS, CRITICAL THINKING

### ACTIVITY 1

1. Identify which is a type I and a type II error:
  - a) A researcher claims that there is a difference in the number of hours slept between younger and older participants, but there was really no difference in hours slept.
  - b) A researcher claims that there was no difference in test scores between two schools, but really one school had better test scores.
2. A researcher conducts a statistical test and finds that the result is significant at  $p \leq .05$ . What is the likelihood that the researcher made a type I error?
3. A researcher conducts a statistical test and finds that the result is significant at  $p \leq .01$ . What is the likelihood that the researcher made a type I error?



## INFERENTIAL TESTS

Different inferential tests are used on different types of data. The test you choose will depend on the following features:

- Are you investigating a difference or relationship between variables?
- Are you using a related or unrelated design?
- What type of data are you analysing?

The last feature refers to what type of data you will analyse, also known as levels of measurement. There are four different levels of measurement: nominal, ordinal, interval and ratio.

## LEVELS OF MEASUREMENT

### Nominal level data

Nominal data is the most basic form of data you can gather because it does not tell you very much information about the data set or results. This is because the data gathered are categorical or grouped and the total number of values in each category or group is calculated. We know nothing about each value within the categories; we just know the category totals. For example, if you conducted a class survey on pet ownership, you are likely to gather data on how many students own a pet or not, or what types of pet the students in your class own.

The class will be asked whether they own a pet, and the frequency of pet owners or individuals without a pet will be calculated. We know very little about the individual differences in pet or non-pet owners, just the totals for each category. Similarly, if you divided the class into students under 1.60 centimetres tall and over 1.60 centimetres tall, and calculate the frequency in each category, you would have nominal level data. However, you would not know the actual heights of each individual student or their height in relation to one another.

### Ordinal level data

Ordinal data tells us a little more information about the values in the data set. Ordinal data is data that are ranked into an order or position. For example, your school may collect house points and present a prize to the house with the greatest number of points at the end of the year. Each house will be placed in rank order of first, second, third, fourth. This data tells us about the position of each house, but it does not tell us how many points were achieved or the difference between each rank. So, the house in first place may have only ten points more than the one in second place, but the house in third place may be way behind second place with 100 fewer points. Ordinal data is often derived from arbitrary scales, such as grades for a test, or ratings of a characteristic such as attractiveness from 1–10. Because the scales are arbitrary, the intervals between each value are not equal in reality. The difference between a grade A and a grade B is not the same as the difference between a grade C and grade D, nor will someone rated as 5 on the attractiveness scale be half as attractive as someone rated as 10.

### Interval and ratio level data

With interval and ratio level data, you do know the differences between each value within a data set because a scale is used where the intervals between each value are equal. Typically, interval and ratio level data are gathered using a recognised scale or tested psychological instrument. The only difference between interval and ratio level data is that ratio data will have an absolute zero. Measurements such as height in centimetres, speed in seconds and distance in kilometres are ratio level data because they start at zero on the scale.



## SKILLS

PROBLEM SOLVING, ANALYSIS,  
CRITICAL THINKING

## ACTIVITY 2

			
Species: hamster Average weight: 0.2 kg	Species: horse Average weight: 600 kg	Species: rabbit Average weight: 2 kg	Species: parrot Average weight: 1.6 kg
			
Species: goldfish Average weight: 0.6 kg	Species: lizard Average weight: 0.7 kg	Species: cat Average weight: 4 kg	Species: tortoise Average weight: 1.5 kg

▲ Figure 12.1 Popular pets by species and weight

We can use these popular pets shown in Figure 12.1 to demonstrate levels of measurement.

1. Group the popular pets into pets that you have and pets that you don't have. Count how many are in each category. This is nominal level data as it is categorical data. Consider other ways in which the popular pets can be grouped.
2. Rate the popularity of each pet on a scale of 1 to 10. This is ordinal data because the pets can be ranked in order on a made-up scale. Consider other ways to rate the pets.
3. Using a ruler, draw a horizontal line on a piece of paper and divide the line into intervals to represent a scale showing weight from 0–600 kg. Label each animal according to their average weight. This is ratio level data because weight is a recognised scale with equal intervals.

For the purpose of selecting which inferential test to use, you will only need to decide between nominal and 'at least' ordinal level data (interval and ratio level data can be treated as ordinal level data for the purpose of choosing a statistical test that you need to learn).

You will only have to learn about a few inferential tests, so you can use the information in Table 12.1 to work out which test you should use.

TABLE 12.1: CONDITIONS FOR SELECTING AN INFERENTIAL TEST

Inferential test	Conditions for use
Chi-squared test	A test of difference and association Nominal data is gathered
Wilcoxon signed ranks test	A test of difference Ordinal (or above) data is gathered A repeated measures design was used
Spearman's rank test	A test of relationship/correlation Ordinal (or above) data is gathered



### MATCHED PAIRS DESIGN

A matched pairs design is an independent groups design where participants in one group are matched on important factors, such as IQ, to participants in another group. For the purposes of selecting an appropriate inferential test, because the groups are matched, it should be treated as a repeated measures design.

### WILCOXON SIGNED RANKS TEST

The Wilcoxon signed ranks test is used as a test of difference between two conditions when the data achieved is at ordinal level or above and the experimental design being used is a repeated measures design or matched pairs design. We are going to look at the scores achieved by two groups of people who were asked to recall words from either a non-categorised list or a categorised list. The scores can be found in Table 12.2 on page 120. Let's look at how the calculation is carried out.

#### Calculation procedure

1. Calculate the difference between the pairs of scores achieved by each participant on the two tests. In the example in Table 12.2 this is done by subtracting the column A score from the column B score.
2. Ignoring any plus or minus signs, rank the score differences.
3. Shift the rank score if a positive difference was found between the scores into the correct column (rank if positive). Shift the rank score if a negative difference was found between the scores into the correct column (rank if negative).
4. Calculate the sum total of the ranks for positive differences and total sum of ranks for negative differences.
5. The smaller of these scores is referred to as the T value (the test statistic or calculated value of the test).

#### MATHS TIP

Assigning ranks to a set of scores literally means to give each score a position on a scale; position 1, position 2 and so on. However, if you have scores of equal value, they cannot share the same rank position, so the positions need to be divided between them. Negative values should be ignored when ranking (ignore the fact that they are negative and treat all scores as positive).

Position	1	2	3	4	5	6	7	8	9
Rank	1	2.5	2.5	4	5	6	7.5	7.5	9
Scores	3	4	4	7	8	9	10	10	13

Notice that the scores of 4 and 10 do not get a rank position of 2 and 3 or 7 and 8, the ranks are divided between them. Once a position has been allocated to a score, the next position needs to be used, for example, scores 4 and 4 use position 2 and 3 (so both are ranked 2.5), but these positions have been used up, so the next score gets position 4.



TABLE 12.2: AN EXAMPLE OF ASSIGNING RANKS

Participant number	Number of words recalled from a non-categorised list	Number of words recalled from a categorised list	Difference	Rank of difference	Rank if positive	Rank if negative
$n = 10$	A	B	(A - B)			
1	8	11	-3	4		4
2	7	7	0	-		
3	9	16	-7	6		6
4	11	12	-1	1.5		1.5
5	13	18	-5	5		5
6	9	8	1	1.5	1.5	
7	8	16	-8	7		7
8	5	17	-12	9		9
9	13	11	2	3	3	
10	6	17	-11	8		8
				Total	4.5	40.5

Ignore figures which have no difference.

The smallest value is 4.5, so this is accepted as the observed/calculated value of  $T$ .

In order to find out whether the calculated value of the Wilcoxon test is significant we need to compare the calculated value of  $T = 4.5$  to a table of critical values for a Wilcoxon signed ranks test.

Calculate the  $n$  (number of participants) excluding those where the difference is zero. In the above example participant 2 showed no difference, so should be excluded from the data set, so we have  $n = 9$ .

TABLE 12.3: CRITICAL VALUES FOR A WILCOXON SIGNED RANKS TEST

	Level of significance for a one-tailed test		
	0.05	0.25	0.01
$n$	Level of significance for a two-tailed test		
	0.1	0.05	0.02
$n = 5$	0	—	—
6	2	0	—
7	3	2	0
8	5	3	1
9	8	5	3
10	11	8	5
11	13	10	7
12	17	13	9

*The calculated value of  $T$  must be equal to or less than the table (critical) value for significance at the level shown.*



**SKILLS**PROBLEM SOLVING, ANALYSIS,  
CRITICAL THINKING**ACTIVITY 3**

Use the table of critical values above (Table 12.3) to determine whether the following calculated values for the Wilcoxon statistical test are significant:

- The calculated value  $T = 4$  for a two-tailed test at  $p \leq .05$  when  $n = 10$ .
- The calculated value  $T = 16$  for a one-tailed test at  $p = p \leq .05$  when  $n = 10$
- The calculated value  $T = 6$  for a one-tailed test at  $p = p \leq .01$  when  $n = 11$

**MATHS TIP**

Observed values are also known as calculated values. This is the score produced by conducting the test.

A critical value (also known as a table value) is the number represented in the critical values table. You should compare the observed/calculated value to the appropriate critical value to work out whether a finding is significant. Always use the instructions provided at the bottom of the critical values table.

Suppose the hypothesis is that there will be more words recalled from a categorised list than a non-categorised list of words. This is a directional hypothesis, because the direction of difference between the conditions is predicted. This means that a one-tailed test is used. The accepted level of significance in psychology is  $p \leq .05$ , so we will need to consult the first column until it reaches the row where  $n = 9$  (as 10 participants were used but  $n$  is the number of scores left ignoring those with 0 difference). The critical value we need to compare the calculated value to is 8. Now we need to consult the instructions below the table. 'The calculated value of  $T$  must be equal to or less than the table (critical) value for significance at the level shown.' This instructs us that the calculated value of  $T = 4.5$  must be equal to or less than the critical value of 8 to be significant at 0.05. Because 4.5 is less than 8, the result is significant and the null hypothesis can be rejected; this means that there is less than a 5 per cent probability that the difference between the sets of scores is due to chance so we can state that participants will recall more words from a categorised list than a non-categorised list.

**ONE- AND TWO-TAILED TESTS**

A one-tailed test is used because the direction of difference can be predicted and a directional hypothesis is stated. A two-tailed test is used when the direction of difference cannot be predicted and a non-directional hypothesis is stated.

**MATHS TIP**

Always compare the observed/calculated value of your test (the test statistic) to the table (critical) value to check for significance, not the other way around. If you forget, refer to the guidance given under each table of critical values and read it carefully.

Once you have calculated your statistical test, you will have to report your finding using a statistical statement. You should include all relevant information during your decision-making process, including the following:

- the calculated value
- the critical value
- the number of participants (or degrees of freedom for a chi-squared test)



- whether it was a one-tailed or two-tailed test
- the level of significance ( $p$ )
- the hypothesis supported/rejected.

For example, the calculated value of  $T = 4.5$  was less than the critical value of 8 for a one-tailed test with  $n = 9$ . Therefore  $p < .05$  and the null hypothesis can be rejected. This means that participants will recall more words from a categorised list than a non-categorised list.

#### MATHS TIP

When a result is significant you express that  $p < .05$  (or the level of probability used).

When a result is not significant you express that  $p > 0.05$  (or the level of probability used).

By using the  $<$  and  $>$  symbols, you are expressing that the probability of the result being due to chance was greater or less than 5 per cent.

#### SENSE CHECKING DATA

It is easy to make errors when calculating descriptive or inferential statistics, so it is important to get a sense of your data and predict a possible calculation outcome beforehand. This rough guess can be used to compare with the actual calculation. If there is a vast difference between what you thought you would calculate and what you actually calculated, it may be that you have made an error in your sums.

Examine your data beforehand. For example, if your data set included these numbers, you could glance over them and predict a mean average of around 5 to 6:

6	4	5	7	4	7	5
---	---	---	---	---	---	---

If your actual mean calculation comes to a number that is not expected, it may be an error. This is particularly important when there are many steps to a calculation, such as working out the standard deviation. Similarly, if you sense check data before calculating a statistical test by looking at the differences between the scores for each group and sense checking whether you would predict the difference to be small or significant, you will be able to compare that to your statistical statement.

In addition to gathering quantitative data, we can also gather qualitative data from research. Case studies are a research method where both qualitative and quantitative data can be gathered.

#### CASE STUDIES OF BRAIN-DAMAGED PATIENTS AND THE USE OF QUALITATIVE DATA

Case studies of brain-damaged patients have been critical to cognitive psychology in order to investigate how brain injury affects cognitive functioning. Sometimes we can understand cognitive functions, such as memory, more in their absence, as is the case in brain-damaged patients.

#### HENRY MOLAISON (HM)

An invaluable case study was that of Henry Molaison who suffered brain injury as a result of a surgical procedure to relieve him from seizures caused by epilepsy.

Henry Molaison, known to thousands of psychology students as 'HM', lost his memory on an operating table in a hospital in Hartford, Connecticut, USA, in August 1953. He was 27 years old and had suffered from epileptic seizures for many years following a bicycle accident as a child. He was operated on by William Scoville, who removed a brain structure within the **temporal lobe** called the **hippocampus**. The procedure did reduce his seizures but left him with severe memory loss.

#### KEY TERMS

**hippocampus:** a structure of the brain responsible for learning, emotion and memory

**temporal lobe:** an area of the brain, called a lobe, situated below the ear



Henry was quickly referred to two neuropsychologists, Wilder Penfield and Brenda Milner, to assess the extent of his amnesia. The hippocampus was known to be associated with consolidating memories, so the removal of this structure was devastating and irreversible.

Having already established themselves by conducting memory research on other case studies of brain-damaged patients, Penfield and Milner realised that Henry was an ideal amnesia case because his injury was specifically localised, and his personality and intelligence were virtually intact.



The hippocampus sits deep inside the brain. ►

### THINKING LIKE A PSYCHOLOGIST

Penfield and Milner's research can be found by searching for the title 'Loss of recent memory after bilateral hippocampal lesions', on the US National Center for Biotechnology Information website. Read the summary of the case of HM and other cases of amnesia to consider:

- the nature of their amnesia
- what cognitive impairments they suffered as a result
- the research that has been conducted to establish their impairments.

### KEY TERMS

**anterograde amnesia:** the loss of ability to make new memories, while memories before the injury remain relatively intact

**retrograde amnesia:** the loss of ability to recall events prior to the injury

Henry was assessed as having **anterograde** and **retrograde** amnesia. His anterograde amnesia resulted in an inability to form any new memories after the operation (he could not store memories for new names, faces, events or information). Despite this, he did learn new skills, such as reverse mirror drawing, although he had no memory of being able to learn them. His retrograde amnesia meant that he lost the ability to retrieve memories from 19 months to 11 years prior to the operation; he was 27 years old at the time of his surgery, so this meant he could only remember partial events after the age of 16 and virtually no events after the age of 25. His retrograde amnesia may not have been due to the surgery but is likely to have been affected by epilepsy medication and the frequency of his seizures prior to the operation.

During his life, Henry was interviewed many times, and this qualitative information has informed an understanding of which cognitive functions were still intact and which were



impaired. Following his death, HM's brain was gifted to psychological research; it was spliced into over 2000 segments to map the human brain at the Brain Observatory in San Diego, California.

### USE OF QUALITATIVE DATA

Unlike quantitative data, which presents data as numbers and statistics, qualitative data presents descriptions of findings in prose. In cognitive psychology, memory research is often reported as quantitative data, but research using case studies of brain-damaged patients is often qualitative in nature, describing what functioning is intact or lost as a result of amnesia and gaining an understanding of the patient's subjective experiences. Qualitative data provides us with detailed accounts of a person's experiences, feelings and beliefs. Some argue that this is the essence of psychology, but others argue that it is at the expense of objectivity as qualitative data requires interpretation, which can be biased.

Qualitative research is not straightforward or mechanistic. Quantitative research involves working through a step-by-step procedure resulting in data analysis, whereas qualitative research is defined by the nature of the investigation and the choices made by the researcher along the way. It is a process of making meaning from responses given by participants and, as such, is open to the individual interpretation of the researcher. As a researcher establishes the themes that emerge from the discourse, they apply meaning to its content and reach subjective conclusions. This does not mean that the emergent themes found are invalid, but it is up to the researcher to explain and justify the emerging conclusions using evidence in the discourse.

Rather than following the hypothetico-deductive model, which proposes a hypothesis and then tests it, qualitative research is an inductive process whereby a research question is proposed and the answer emerges from careful decoding of the information gathered. Information can be gathered using a variety of methods, such as unstructured or semi-structured interviews, questionnaires with open-ended question types, group discussions, speech analysis and a literature review. The non-numerical information gathered is carefully transcribed and notes are taken on the emerging themes or ideas that run through the text. There is no single type of qualitative research, and no single way of conducting qualitative analysis. However, they generally follow a similar format.

### Types of qualitative methods

There are several types of qualitative methods:

- content analysis (although some dispute this method as being truly qualitative as it quantifies qualitative material)
- discourse analysis
- grounded theory
- interpretive phenomenological analysis.

Common to all qualitative research is the way it is used to understand how individuals make sense of their own experiences. Qualitative research aims to understand how people perceive their world and make sense of it. This results in rich descriptions based on what people disclose about themselves, the connections they make between events that happen and the meanings they attribute to them, and how they feel.

Qualitative analysis is idiographic; it does not claim any general rules that apply to other people, but only that the results are specific and unique to the individual involved. Although some research can claim that emergent themes are general to others, qualitative research is often based on small sample sizes and built up into a case study.

Once qualitative data has been gathered, transcriptions are made of the discourse and the researcher immerses themselves in the text, making notes on the feelings, beliefs and meanings



given to experiences by the participants. Then the researcher reflects on these notes, checks that the notes reflect the content of the transcript and develops from these notes the emerging themes from the transcript. These themes are presented as conclusions with extracts from the transcript to support the interpretation given to them.

**SKILLS**

ANALYSIS, EMPATHY,  
COMMUNICATION

**ACTIVITY 4**

Download the lyrics to one of your favourite songs. Conduct your own qualitative analysis using the following steps:

1. Read the lyrics through (without singing them!).
2. In the margin of each line, write a summary of the lyrical content, and consider the meaning of the lyrics.
3. Reflect on your notes, synthesise them and consider any overall message being delivered in the song.
4. Drawing together your themes, suggest possible reasons for these themes existing and present them using evidence from the lyrics in the song.

**EVALUATION**

Qualitative analysis gathers rich descriptions based on meaning, which can often be missed when using quantitative methods. However, it is laborious and difficult to conduct because data analysis and transcription takes a lot of time. It does not follow any particular standardised format and has been criticised for being unscientific and subjective. Additionally, many argue that it is largely a descriptive rather than explanatory method. However, qualitative research goes beyond merely describing discourse, it is a process of comprehending the information, synthesising the material and theorising about why the themes exist. A strength of qualitative research is that it is very important when trying to understand some of the important issues in health and clinical psychology, such as how patients experience palliative care, or what caregivers believe could help them as carers for those with a serious long-term illness. These big questions could not be addressed by simply administering a questionnaire which would be unable to address people's deeply held beliefs and feelings.

**CHECKPOINT**

1. Identify the level of measurement being described:
  - a) Participants were given a recall test of a word list of ten words. The number of words correctly recalled by each participant was recorded.
  - b) Patients with amnesia were categorised as having retrograde amnesia or anterograde amnesia.
  - c) Performance on a cognitive task was rated by independent researchers, who scored them from 1 to 10: 1 indicated very poor performance and 10 indicated superior performance.
2. Identify which is a type I error and type II error:
  - a) A researcher found that participants were able to recall more categories of dog breeds than cat breeds. Adopting a 10 per cent level of probability she came to the conclusion that it was easier to recall dog breeds, however, she was wrong.
  - b) A doctor assessed a patient's mental health using a range of tests and came to the conclusion that the patient did not have a mental illness. Adopting a 1 per cent level of probability, the doctor made an error and the patient did have a mental health condition.



## SKILLS

ANALYSIS, COMMUNICATION,  
CRITICAL THINKING, PROBLEM  
SOLVING, REASONING

## EXAM PRACTICE

1. Bertrand developed a visuospatial game to see if spatial awareness could be improved through practice using the game every day for a week. He scored participants' spatial ability before using the visuospatial game and again after a week. His results are presented in the table below:

Participant	Spatial score before using the game	Spatial score after using the game for one week	Difference	Rank	Rank if positive	Rank if negative
A	44	78				
B	47	74				
C	56	88				
D	65	76				
E	68	80				
F	54	53				
				Total		

- a) Copy and complete the table and calculate the Wilcoxon signed ranks test.  
 $T =$  \_\_\_\_\_ (4 marks)
- b) Determine whether Bertrand's results are significant for a one-tailed (directional) test at  $p \leq .05$ . (2 marks)
- c) Bertrand decided to calculate whether his results were significant at the  $p < .01$  level of probability. Describe what is meant by  $p \leq .01$  in relation to Bertrand's investigation. (2 marks)
- d) Explain one strength of Bertrand applying a 'sense check' to the data gathered in his investigation. (2 marks)
- e) Give two reasons why Bertrand used a Wilcoxon signed ranks test. (2 marks)
2. Priya carried out a Wilcoxon signed ranks test on her data to calculate the statistical significance for the difference in words recalled following a memory training exercise. The calculated value ( $T$ ) was 8 ( $T = 8$ ) for two-tailed tests at  $p < .05$  with  $n = 10$ .
- a) Explain whether Priya's result is significant or not. (2 marks)
- b) Explain the level of measurement recorded in Priya's experiment. (2 marks)
3. Explain two ways that the case study of Henry Molaison demonstrates the differences between short-term memory and long-term memory. (4 marks)



# CHAPTER 13 STUDIES

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- describe and evaluate one classic study: Bartlett (1932) War of the Ghosts
- describe and evaluate one contemporary study: Schmolck et al. (2002) Semantic knowledge in patient HM and other brain-damaged patients
- describe and evaluate Darling et al. (2007) Behavioural evidence for separating components within visuospatial working memory.

## GETTING STARTED

Read the 'War of the Ghosts' story through once. Then cover the story up and recount as much of the story as you can remember.

### 'War of the Ghosts' folk tale

One night two young men from Egulac went down to the river to hunt seals, and whilst they were there it became foggy and calm. Then they heard war-cries, and they thought 'Maybe this is a war party'. They escaped to the shore, and hid behind a log. Now canoes came up, and they heard the noise of paddles, and saw one canoe coming up to them.

There were five men in the canoe, and they said, 'What do you think? We wish to take you along. We are going up the river to make war on the people.'

One of the young men said, 'I have no arrows.'

'Arrows are in the canoe,' they said.

'I will not go along. I might be killed. My relatives do not know where I have gone. But you,' he said, turning to the other, 'may go with them.'

So one of the young men went, but the other returned home.

And the warriors went up the river to a town on the other side of Kalama. The people came down to the water, and they began to fight, and many were killed. But presently the young man heard one of the warriors say, 'Quick, let us go home: that Indian has been hit.' Now he thought: 'Oh, they are ghosts.' He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac, and the young man went ashore to his house and made a fire.

And he told everybody and said: 'Behold I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick.'

He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.

He was dead.



**CLASSIC STUDY: BARTLETT (1932) WAR OF THE GHOSTS****AIMS**

Bartlett aimed to investigate whether the memory of an unfamiliar story would be affected by previously stored knowledge. He believed that the unfamiliarity of the story would lead to distortion of memory when the story was recalled. This would test whether memory was reconstructive and whether participants' recall would be affected by cultural expectations/schema.

**SAMPLE**

The sample included 20 British undergraduate students attending the University of Cambridge. The sample included 7 male and 13 female students. The sample was chosen to understand how individuals from a Western cultural background recalled and reconstructed a culturally unfamiliar story. The participants were not told the aim of the study but were informed that they would be tested on accuracy of recall.

**KEY TERM**

**serial reproduction:** a participant recalls information at increasing time intervals (for example, after 10 minutes, a week, a month)

**PROCEDURE**

The story used was a Indigenous American tale called 'War of the Ghosts', which contained unfamiliar names and content. The participants were asked to read the story to themselves twice and recall it again at different intervals; one after 15 minutes and at further intervals of several hours, days, weeks and years. This is known as **serial reproduction**.

**SKILLS**

CREATIVITY, COMMUNICATION,  
CRITICAL THINKING

**ACTIVITY 1**

Reconstructive memory can be tested using a classroom exercise. Write a fictional story about an event in around 200–300 words. Tell your story to a class peer, and then ask them to recount the story to another student, and so on until the whole class has heard a version of the story. The last person who is told the story should be asked to write down their recollection. Compare the original story to the last version. Has it changed? If so, how?

**RESULTS**

Bartlett found that participants' reproductions of the War of the Ghosts story changed as they remembered it. This happened after 15 minutes and throughout the further reproductions later. While the order of the story and events were relatively preserved throughout the reproductions, the story content was transformed to align with cultural schemas. When participants were asked to recall the story for the first time, they tended to omit or simplify certain details, resulting in a shorter and more concise version of the story. Seven participants omitted the title of the story, and ten participants transformed the title, for example to 'War-Ghost story'. Later reproductions became shorter (from 330 words to around 180 words after repeated reproductions) and more culturally coherent, further omitting and altering details to make the story more culturally relevant.

A number of transformations to the story were reported in a qualitative analysis of the recalled stories; in particular, objects within the story were made more familiar – 'canoe' was changed to 'boat', 'hunting seals' changed to 'fishing'. Many participants did not grasp the role of the ghosts in the story, so simply omitted to mention them or rationalised their presence in some way.

**CONCLUSIONS**

Bartlett concluded that memory is reconstructed each time it is recalled. It is rarely accurate, and is prone to distortion, rationalisation, transformation and simplification. Even recall after several minutes elicited errors in recall, and these errors tended to be consolidated in subsequent reproductions. The process of remembering is constructive in nature and influenced by cultural inferences made by an individual.



**EVALUATION OF BARTLETT (1932)**

Bartlett's research was pioneering in the field of cognitive psychology, challenging the conception that memory was an accurate and faithful account of events. This new approach to studying memory has led to many advancements in memory research. His qualitative analysis of the story also gave a greater depth of understanding of how memory works. Bartlett's research has been applied in legal fields to understand the nature of eyewitness testimony when recalling a criminal event. If an eyewitness is known to simplify and rationalise an event that they have witnessed, the police could use this understanding to be cautious when using testimony as evidence.

However, Bartlett used a story which was deliberately unfamiliar to the students, which was the purpose, but it can lead us to assume that memory is unreliable. In an everyday context we are not presented with such unfamiliar material, so memory errors are less likely. This suggests that Bartlett's research presents a rather overly pessimistic view of human memory. This view is supported by Wynne and Logie (1998) who asked students to recall events which occurred at the beginning of their first year at university, and then to recall the events several times over a few months. They found very limited reconstructive memory, probably because they were not experiencing particularly unfamiliar events. This suggests that, in real life, memory is not as reconstructive as Bartlett may have claimed.

A strength of Bartlett's research is that he used the same War of the Ghosts story for each participant, which means that the apparatus used was standardised across the sample. The study can therefore be retested to see whether story transformations would occur consistently which would increase the reliability of his findings. Roediger et al. attempted a replication of Bartlett's research using the War of the Ghosts story on 30 Washington University undergraduates and found similar forgetting and distortion after six months, which supports Bartlett's findings.

However, Bartlett did not apply any controls between reading the story and repeating the story hours, days, weeks and years later, so we cannot be sure that participants' recall of the story was not affected by other factors, such as reading the story again themselves or discussing the story with other participants. This may reduce the reliability of the findings.

Bartlett only used a sample of 20 participants, which can limit the generalisability of the findings, as they may be restricted to the type of participants used. It was appropriate to use British participants, as the aim of the study was to investigate cultural schema on recall of an unfamiliar story. However, we cannot be sure that other cultures would transform a culturally unfamiliar story as other cultures were not tested.

**THINKING LIKE A PSYCHOLOGIST**

Consider the weaknesses of Bartlett's research and suggest one way that his investigation could have been improved.

**WIDER ISSUES AND DEBATES****Psychology as a science**

Bartlett's experiments had a distinct lack of control and standardisation in the procedures he followed. Participants were reasonably free to deliberate over the objects and stories presented to them. In one instance, he simply bumped into a previous participant after six-and-a-half years and suggested he recall the War of the Ghosts story. The findings were qualitative; he described the nature of recalled information in a descriptive way. Therefore, his experiments can be criticised for lacking scientific rigour and being open to subjective interpretation.

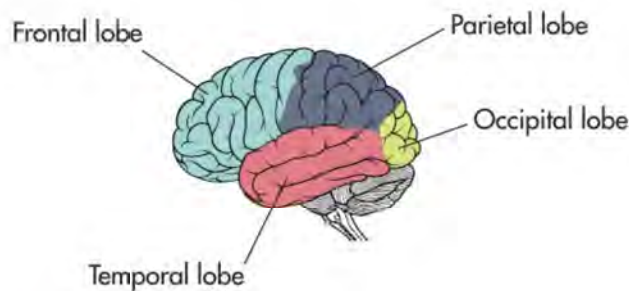


## CONTEMPORARY STUDY : SCHMOLCK ET AL. (2002) SEMANTIC KNOWLEDGE IN PATIENT HM AND OTHER PATIENTS WITH BILATERAL MEDIAL AND LATERAL TEMPORAL LOBE LESIONS

Case studies of brain-damaged patients have been invaluable in understanding the nature and function of human memory. Amnesia patients have been investigated in neuropsychological research to establish which regions of the brain are responsible for which stores and processes involved in encoding new and recollecting previously learned information. It is widely accepted that damage to the temporal lobe of the brain is associated with memory loss, in particular anterograde and retrograde amnesia, but often well-established long-term semantic knowledge remains intact.

### AIM

Heike Schmolck, Elizabeth Kensinger, Suzanne Corkin and Larry Squire attempted to investigate the effects of specific brain damage on semantic memory using case studies of brain-damaged patients compared to a control group of 'normal' participants. Specifically, they wanted to test the relationship between semantic test scores and temporal lobe damage and to determine whether Henry Molaison (HM) was unique in the way the brain damage he sustained affected his memory compared to similar damage in other cases.



► Figure 13.1 Lobes of the human brain

### KEY TERMS

**anterolateral:** to the front and side of

**bilateral:** both hemispheres of the brain are involved

**lateral:** towards the side of

**medial:** situated in the middle

### SAMPLE

Six participants with amnesia were compared to eight 'normal' control participants. The control group was matched for age (74 years old), sex (male) and education (12.4 years) to the amnesia patients (apart from one female). The six amnesia patients were divided into groups according to the level of brain damage they suffered. Two patients had brain damage largely restricted to the hippocampus (HF); three patients had suffered encephalitis resulting in large **medial** temporal lobe and **anterolateral** temporal cortex damage (MTL+) and Henry Molaison (HM) had medial temporal lobe damage with some **lateral** temporal lobe damage following surgery to resolve his epilepsy. All patients had suffered **bilateral** damage to varying degrees. A biography of each patient was compiled.

### PROCEDURE

Nine tests were conducted over three to five different sessions with participants. Seven of these tests were from the semantic test battery and two tests were constructed by the researchers. The tests were all based on line drawings of 24 animals and 24 objects. The 48 line drawings were further categorised into groups of eight domestic land animals, non-native land animals, water animals, birds, electrical household items, non-electrical household items, vehicles and musical instruments.

### Tests

The nine tests were designed to measure semantic knowledge related to identifying, sorting or defining the line drawings. A further four semantic tests were conducted on some of the patients and control participants (HM only received test 10 of these additional tests).



**WIDER ISSUES AND DEBATES****Socially sensitive research**

The use of case studies of brain-damaged patients can be regarded as socially sensitive research because it is sensitive for the individual patient and their family. The amnesia patients have suffered injury or disease resulting in fundamental impairment to possibly the most vital of human cognitive processes: memory. Memory anchors us to our past and enables us to project ourselves into the future; it links us to those we are close to and enables us to function normally in everyday life. Deficits in memory have catastrophic implications not only for the individual and their ability to live a full life, but also on the family responsible for their care. This is very sensitive when amnesia occurs later in life when families have to adapt to significant lifestyle changes and potential loss of the person they once knew.

TABLE 13.1: TEST CONDITIONS

<b>Tests 1–4</b>	Pointing to or naming a picture	Participants were asked to point to or name a picture when given the name or a description of the object.
<b>Test 5</b>	Semantic features	Participants were asked to answer yes/no questions about the physical and associated features of an object.
<b>Tests 6 and 7</b>	Category fluency and sorting	Participants were asked to name or sort into categories as many examples as possible within a category or class (living/non-living) of objects without a picture cue.
<b>Tests 8 and 9</b>	Defining task	Participants were given the name or picture of the 24 less common objects and they were asked to provide a definition.
<b>Test 10</b>	Pyramid and palm tree test	Participants were given a target picture and two test pictures and asked which test picture went with the target picture. For example, a target picture of a saddle was presented with two test pictures of a horse and a goat, and participants were asked to say which test picture went with the target.
<b>Test 11</b>	Object/non-object discrimination task	Participants were asked whether the object presented to them was real or not.
<b>Test 12</b>	Colouring object task	Participants were asked to colour 28 line drawings of objects using appropriate colours from a selection of four coloured pencils.
<b>Test 13</b>	Nouns and verbs test	Participants were given a fill-in-the-gaps exercise designed to test knowledge of regular and irregular verbs and tenses. For example, 'A hoof is hard, in fact most _____ are hard'.

**LINK**

See page 108 in Chapter 11 for more on inter-rater reliability.

The percentage of correct responses was scored for all tests other than tests 8 and 9, which were recorded and transcribed and were given an accuracy rating of between 0 and 4 by the researchers. These transcripts were also assessed for errors in grammar, expression, confusion and word intrusions. Inter-rater reliability was established for the scoring.

**RESULTS****Tests 1–9**

Patients with damage restricted largely to the hippocampus (HF) were able to name, point out and answer questions about objects they were given with considerable accuracy. They were also



comparable to the control group when asked to generate examples of a given category or give definitions of objects. Patients with damage to the medial temporal lobe and anterolateral temporal cortex (MTL+), performed less well at naming, pointing out or answering questions about objects.

TABLE 13.2: PERCENTAGE OF CORRECT ANSWERS GIVEN (TESTS 1–4)

	Control group	HM	HF patients	MTL+ patients
Tests 1–4	98.9%	96.5% Tests 1–4 66.7% Test 4	100%	78.1%

MTL+ patients also had considerable difficulty generating examples in a given category. Notably one MTL+ patient could not generate names of dog breeds despite previously being a dog breeder. They also had difficulty defining objects, often giving less detail which contained more errors; HM performed worst among these patients. Interestingly the MTL+ patients found it most difficult to identify and recall facts about living objects compared to non-living objects in all tasks.

TABLE 13.3: PERCENTAGE OF CORRECT ANSWERS GIVEN (ITEMS GIVEN, TESTS 5–7)

	Control group	HM	HF patients	MTL+ patients
Test 5	91.9%	85.4% living items 95.8% non-living items	96.9%	76% living items 85.8% non-living items
Test 6	128.9 average items given	43 items given	112 average items given	75.7 average items given
Test 7	97%	93.5%	98.5%	97%

For tests 8 and 9 the participants' answers were transcribed and given a score between 0 and 4 for accuracy of the definitions given for a picture or name.

TABLE 13.4: AVERAGE RATING GIVEN FOR ACCURACY (TESTS 8 AND 9)

	Control group	HM	HF patients	MTL+ patients
Test 8	3.2	1.8	3.1	2.0
Test 9	3.2	2.0	3.2	1.8

MTL+ patients and HM provided poor definitions of pictures and words and made errors which resulted in many of the definitions being unidentifiable.

#### Patient H.M., swan

Well ... a swan ... flies around sometime (um hmum) ... but it goes on the water too (um hmum) ... and goes after fish in a way (G) ... (um hmum) and ... PAUSE ... (what else does it do, what does it look like) ... and it's got a very long neck ... (um hmum) and uh ... well these (G) is just scooped over a certain area (G) and they (G) find the fish ... a lot of fish (F) in there (G) and they could swallow them (G) ... (um hmum) and ... are ... and ... (F) ... by doin' that (G) just sometimes (G) they can keep them stored in their mouth. (um hmum) ... and uh, and the throat (F) ... (um hmum) ... so (G) they can get everything down that way (G) ... (exp what, what is their color) ... white ... some of them are white, some of them are brown ... (ok) ... but you mostly think of a white swan ... (ok).

► Figure 13.2 HM's definition of a swan and the researcher's scoring



When the participants were ranked in terms of their overall performance on these tests, their rank appeared to correspond directly with the extent of their brain damage. In particular, damage to the anterolateral temporal cortex seemed to cause impairment in semantic knowledge.

### Other semantic tests (Tests 10–13)

When asked to decide whether an object was real or not, two of the MTL+ participants performed well but one made eight errors. All MTL+ patients scored well on the colouring task. On the Pyramid and palm tree test, the MTL+ patients and HM scored either below the required 90 per cent accuracy or performed below the control group. The MTL+ group were able to produce regular plurals and verbs but performed less well at producing irregular verbs and plurals. In contrast, HM performed well on both tasks, suggesting that the difficulty with irregular items is associated with anterolateral temporal cortex damage.

### CONCLUSIONS

The MTL+ patient data shows that damage to the anterolateral temporal cortex is consistent with a loss of semantic knowledge that results in a 'blurring' or overlap of conceptual knowledge that leads to confusion. This semantic knowledge is associated with the anterolateral region and is not associated with the medial temporal lobe. This is consistent with patients with **semantic dementia** whose impairment is restricted to the anterolateral temporal cortex and the medial temporal lobe is relatively unaffected. Additionally, **MRI scans** seem to suggest that the more progressed the disease, the greater the anterolateral damage.

#### KEY TERMS

**MRI scan:** a brain scan that produces an image of the structure of the brain, a bit like an X-ray but with more detail

**semantic dementia:** a degenerative neurological disorder resulting in loss of semantic memory

### HM – A SPECIAL CASE

HM was similar to the MTL+ patients in tests of definitions, suggesting that his impairment had a similar physiological basis. However, in many respects his semantic knowledge was in the normal range in other tests. Unique to HM was the large number of grammatical errors he made during these tests. The researchers suggest that his deficit in language production was unlikely to be related to his temporal lobe damage but due to other factors during his childhood. HM suffered from a seizure at the age of 10, was from low socioeconomic status and his schooling was interrupted. These factors could have contributed to poor language development.

The researchers conclude that the hippocampus is not involved in semantic knowledge because HF patients performed similarly to the control group. HM was less affected than the MTL+ patients, which leads to the conclusion that the anterolateral temporal cortex and not the medial temporal lobe is involved in semantic knowledge. The language impairment displayed by HM was unrelated to his neurological condition and probably due to his upbringing.

### WIDER ISSUES AND DEBATES

#### Nature–nurture

Schmolck et al. (2002) believed that HM's language impairment had developed due to causes other than the neurological impairment caused by his surgery, that it was perhaps due to nurture rather than nature. It is possible that his low socioeconomic status and interrupted education had a negative effect on his language development.

The following transcript was made of HM describing a motorcycle:

'... well... it can be... uh,... a motorcycle is... uh... maybe, ... it's on two wheels... And it could be have 'cause my father used to ride one at one time... and he stopped himself because the doctor told him not to.'

It seems somewhat questionable whether these errors in grammar and form could be solely attributed to educational disruption and economy. However, the nature–nurture debate will never be resolved in this case because HM's language was not tested prior to the surgery.



## KEY TERMS

**brain stimulation:** the use of electrodes to stimulate regions of the brain and examine resulting behavioural or cognitive changes as a result

**unilateral lobectomy:** the surgical removal of parts of the brain from one hemisphere

## EVALUATION OF SCHMOLCK ET AL. (2002)

Case studies of brain-damaged patients are rare and therefore small in number. The small sample size involved in this investigation limits the generalisability of the conclusions made. However, findings from semantic dementia, neuroimaging, **brain stimulation** and **unilateral lobectomy** all support the finding that the anterolateral and, in particular, the lateral temporal cortex is involved in semantic knowledge, strongly reinforcing the conclusion of this study.

## THINKING LIKE A PSYCHOLOGIST

It is easy to criticise research for its shortcomings without understanding the reason for such problems or trying to understand whether the problem is actually well founded. Answers in psychology are rarely agreed on, so it is important to discuss evaluation from alternative points of view rather than taking a single-sided or definitive approach. To be able to evaluate effectively and demonstrate a mature and considered approach to evaluation, it is worth considering these questions:

- Is the criticism justified?
- Is there any further support for or against the criticism being levelled at the research?
- Does the criticism demonstrate the view of certain psychologists or groups of people? If so, could an alternative view be considered?

The special case of HM reported in this investigation was seen as a product of his upbringing and events prior to his surgery for epilepsy. However, it could be argued that the individual differences found in this investigation demonstrate individual variation in neurology which may account for the differences between them. It is often the case that retrospective research, such as this study, cannot establish causal relationships between the injury sustained and the resulting impairments tested. The brain is adaptable and can compensate for injury. The findings of tests may reflect the ability of the brain to adapt to injury rather than the injury itself. However, prospective research is not possible as it would involve predicting those individuals who are likely to sustain such brain damage.

The stimuli that are common to many cognitive investigations used to test semantic knowledge, such as the line drawings used, also lack mundane realism and may not tap into semantic knowledge as it is used in everyday life. Such research may be said to lack ecological validity, as the findings cannot be generalised to everyday use of semantic memory.

A strength of the study is that the researchers used 14 raters to identify the definitions given by the participants and gave a quality score from 0 to 4. Because this is qualitative data it is open to subjective analysis, but the use of 14 independent raters made the scoring of these definitions more objective.

## WIDER ISSUES AND DEBATES

## Ethical issues

Doctor Scoville, the surgeon responsible for HM's surgery, was vilified for his reckless approach. However, the case of HM was fundamental to our understanding that memory is a distinct cognitive process, independent of language and thought. Damage to his hippocampus and temporal lobes enabled neuroscience to establish a location for memory in the brain. This is arguably the most important advance in our understanding of memory functioning and HM was the most researched individual in the field of neuroscience.



### CONTEMPORARY STUDY: DARLING ET AL. (2007) BEHAVIOURAL EVIDENCE FOR SEPARATING COMPONENTS WITHIN VISUOSPATIAL WORKING MEMORY

Evidence from various sources seem to suggest that the visuospatial sketchpad of the working memory model can be separated into different subsystems. One source of information came from patients with neurological damage, suggesting that visual information is retained in a different subsystem to information about spatial location. The researchers used an interference task to test whether there were different subsystems within the visuospatial sketch pad to process visual appearance and spatial location.

#### AIMS

Stephen Darling, Sergio Della Sala and Robert H. Logie aimed to investigate whether **dynamic visual noise task (DVN)** would interfere with recall in an appearance and location task.

Darling et al. also wanted to investigate whether a tapping task would interfere with recall in an appearance and location task.

#### SAMPLE

The sample was 72 participants recruited from a volunteer participation panel of the Department of Psychology at the University of Aberdeen. The sample consisted of 44 female and 28 male non-students.

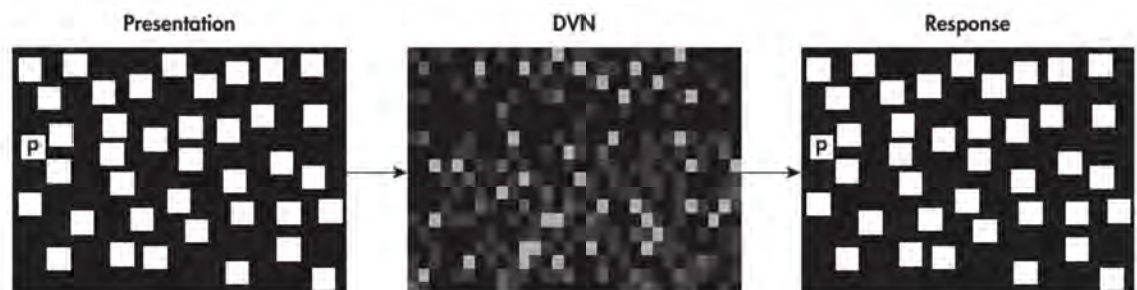
#### PROCEDURE

The 72 participants were randomly allocated to one of six possible conditions; based on appearance or location, and whether the interference task was DVN, tapping or a control group with no interference.

The appearance task involved participants concentrating on the font of a lowercase letter 'p', whether it was different or similar to a comparison 'p'.

The location task involved participants concentrating on the location of the letter 'p' on a screen, whether it was in a different or similar location to a comparison.

The DVN interference task involved participants watching a screen where a square matrix of 80 by 80 dots appearing with each dot being coloured white or black at random, flashing from black to white at an average rate of 300 dots per second.



► Figure 13.3 The location task and DVN

The tapping interference task involved participants tapping a figure of eight pattern on a keypad with nine keys arranged in a three by three array.

Each participant took part in three sets of 24 trial conditions. If they were randomly allocated to the tapping or DVN interference task they carried out the interference task during a 0.5 second, 5.5 second and 15.5 second delay interval (the 0.5 second delay interval was used as a baseline).

Participants were positioned in front of a screen with a series of 30 white squares on a black background. In one of the white squares appeared a lowercase letter 'p' in different font styles.



The letter was visible for 0.5 seconds and then disappeared. Depending on conditions, the participants performed the interference task (DVN or tapping) for 0.5, 5.5 or 15.5 seconds.

Following the interference task, a new screen with the white squares reappeared and a letter 'p' was presented in one of the white squares either in the same location and same font (25 per cent of the time), in the same location but a different font (25 per cent of the time), in a different location but the same font (25 per cent of the time), or in a different location and different font (25 per cent of the time).

Participants who focused on the appearance of the font had to indicate whether the initial font was the same or different to the new screen, and participants who focused on the location of the 'p' had to indicate whether the original 'p' was in the same or different location on the new screen.

### SKILLS

CREATIVITY, ANALYSIS, CRITICAL THINKING

### ACTIVITY 2

You can create your own location and appearance task using presentation software. Create the first slide with a number of white boxes and in one box add a letter in a particular font. Then add a second slide with DVN and set up animations to make the slide flash. Then create a third slide by copying the first slide but move the letter to a different white box or change the font. This activity will help you understand how the procedure was carried out.

### RESULTS

TABLE 13.5: MEAN ACCURACY OF SCORES FOR LOCATION AND APPEARANCE IDENTIFICATION IN EACH CONDITION

Interference (seconds)	Location			Appearance		
	Control group	Tapping interference task	DVN interference task	Control group	Tapping interference task	DVN interference task
0.5	23.75	23.91	23.58	22.75	23.00	22.83
5.5	23.00	21.25	22.17	22.00	21.25	21.17
15.5	22.67	19.75	21.42	20.58	20.95	20.08

The researchers suggest that there were individual differences in susceptibility of appearance memory to DVN interference than susceptibility of location memory to tapping interference.

The researchers then analysed the time taken for participants to identify the font appearance and 'p' location, referring to the time taken as latency.

TABLE 13.6: MEAN LATENCY TIME (SECONDS) TAKEN BY PARTICIPANTS TO RECALL THE FONT APPEARANCE OR LOCATION OF THE LETTER IN EACH CONDITION

Interference (seconds)	Location			Appearance		
	Control group	Tapping interference task	DVN interference task	Control group	Tapping interference task	DVN interference task
0.5	1.40	1.33	1.45	1.75	1.65	1.62
5.5	1.74	2.02	1.79	2.05	2.06	2.56
15.5	2.19	2.55	2.03	2.63	2.35	2.67



Participants who carried out the tapping interference task during the delay periods showed greater mean latencies for identifying the correct location of the letter, but no greater latency for identifying the font appearance. Participants who carried out the DVN interference task during the delay periods showed greater mean latencies for identifying the appearance of the font than the location of the letter.

### CONCLUSIONS

The spatial task (tapping) disrupted spatial memory (location), but not visual memory (appearance), and to some extent the visual task (DVN) disrupted visual memory (appearance) but not spatial memory (location).

The researchers suggest that appearance information and location information are accessed differently in working memory, suggesting that they may be separate components within the visuospatial sketchpad.

### EVALUATION OF DARLING ET AL. (2007)

One strength of Darling et al.'s experiment was that it was conducted under controlled laboratory conditions. Participants were randomly allocated to one of six conditions, which meant that there was no experimenter bias in participant selection for one of the memory tasks, and one type of student was not grouped into one condition. The procedure was highly standardised by using a screen to present the visual arrays using accurate timings, which means that the study can be replicated to test whether other participants had similar latencies in recall time of the appearance and location of the letter 'p' to support the existence of separate components of the visuospatial sketchpad of working memory.

However, Darling et al. only measured the visuospatial memory in one way, using black and white stimuli. Visual memory processes a much wider range of visual tasks in our everyday environment, so the findings of this research may be restricted to certain types of task, and we cannot draw conclusions about working memory as a whole. They also only tested volunteers from a panel registered with the Psychology Department at the University of Aberdeen, which may limit the generalisability of their findings to this sample of participants.

### SKILLS

CRITICAL THINKING, ANALYSIS,  
INTERPRETATION

### ACTIVITY 3

In the exam you may be asked to identify extraneous variables associated with psychological research. Practise by assessing the extraneous variables and controls in one of the research studies you have covered in this topic.

Identify and list:

- participant variables
- situational variables
- controls that the researchers used.

Studies:

- Bartlett's (1932) War of the Ghosts
- Schmolck et al. (2002) Semantic knowledge in patient HM and other patients with bilateral medial and lateral temporal lobe lesions
- Darling et al. (2007) Behavioural evidence for separating components within visuospatial working memory.



**CHECKPOINT**

1. Identify the study from the sample being described:
  - a) Seventy-two participants recruited from a volunteer participation panel of the Department of Psychology at the University of Aberdeen.
  - b) Twenty undergraduate students from the University of Cambridge.
  - c) Six participants with amnesia were compared to eight 'normal' control participants.
2. Identify the study from the quantitative data described:
  - a) The story became shortened from 330 words to 180 words on average after six reproductions.
  - b) HM scored 1.8 and 2.0 for accuracy of defining pictures and words compared to 3.1 and 3.2 accuracy scores achieved by HF patients.
  - c) The average latency for recall of the location of a letter after a tapping interference task (spatial) was 2.55 seconds, which was longer than the latency for recall of the location of a letter following a DVN interference task (visual) of 2.03 seconds.

**SKILLS**

ADAPTABILITY, ANALYSIS,  
COMMUNICATION, CRITICAL  
THINKING

**EXAM PRACTICE**

1. In your study of cognitive psychology you will have learned about the contemporary study by Schmolck et al. (2002) Semantic knowledge in patient HM and other patients with bilateral medial and lateral temporal lobe lesions.
  - a) Describe one aim of the study by Schmolck et al. (2 marks)
  - b) Explain one strength of the study by Schmolck et al. (2 marks)
  - c) Explain one weakness of the study by Schmolck et al. (2 marks)
2. In your study of cognitive psychology you will have learned about Bartlett's (1932) War of the Ghosts study.
  - a) Describe the sample that Bartlett used in his study. (1 mark)
  - b) Explain one improvement to Bartlett's War of the Ghosts study. (2 marks)
3. In cognitive psychology you will have learned about Darling et al.'s (2002) DVN study. Describe the procedure of this study. (4 marks)
4. Evaluate Bartlett's War of the Ghosts study (1920). (8 marks)



# CHAPTER 14 PRACTICAL INVESTIGATION

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- design and conduct a practical investigation using a laboratory experiment in an area relevant to the topics covered in cognitive psychology.

In conducting the practical research exercise, you must:

- design and conduct a laboratory experiment using a repeated measures design to gather quantitative data on a topic in cognitive psychology to include descriptive statistics as analysis and the Wilcoxon non-parametric test of difference
- make design decisions in your planning, using a repeated measures design, sampling decisions, operationalisation, control, ethical considerations, hypothesis construction, experimenter effects and demand characteristics and order effects
- collect and present the data you have gathered using appropriate tables, graphs, descriptive statistics and a Wilcoxon non-parametric test of difference, and draw conclusions from your data
- consider the strengths and weaknesses of your experiment and suggest possible improvements that could be made
- use typical reporting conventions to document your procedure, results and discussion.

## GETTING STARTED

There are many laboratory experiments in cognitive psychology that you could replicate or modify. In this chapter you will follow an example of a laboratory experiment used to investigate the influence of acoustic similarity on short-term memory recall. Although you may choose a different area of cognitive psychology to investigate, this section will provide a worked example of how to go about designing, conducting and discussing a practical investigation.

Before you begin planning your practical investigation, you should review Chapters 11 and 12 in this unit to familiarise yourself with key terms and concepts concerning laboratory experiments.

## WIDER ISSUES AND DEBATES

### Psychology as a science

Science follows the hypothetico-deductive method. This means that in order to be scientific (objective, reliable and empirical) we must first propose a testable hypothesis and then conduct an experiment to gather empirical data that will support or refute this hypothesis. In this experiment, a clear hypothesis has been predicted and measures taken to collect data that can be used to test this hypothesis.

## LABORATORY EXPERIMENT TO INVESTIGATE THE WORD LENGTH EFFECT ON SHORT-TERM MEMORY RECALL

### AIM

All research begins with an aim that is typically based on current theory or research into an area. The aim of this experiment is to investigate the effect of word length on short-term memory. This is based on the theory that the phonological loop has a limited capacity for sound-based information, so longer words will result in poor recall performance. It is important that you read around the topic before you plan your practical investigation to establish a rationale for your own aim.



## HYPOTHESES

Your practical investigation should have an experimental hypothesis and a null hypothesis. Once you have read around the topic you are interested in, you will need to decide whether your experimental hypothesis is directional or non-directional. If prior research and theory indicates the likely direction in which your results will go, you must use a directional hypothesis, but if there are conflicting theories and research, it may be more prudent to use a non-directional hypothesis.

Before a clear hypothesis can be written, the independent and dependent variables should be defined and operationalised. This practical investigation is looking to see if short or long words (the independent variable) will have an effect on recall (the dependent variable).

### Experimental hypothesis

The experimental hypothesis for this practical investigation will be directional because prior theory and research indicates that the shorter words will be recalled more than long words because longer words take up more acoustic capacity in the phonological loop than short words, which take less time to pronounce.

### Null hypothesis

Remember that your practical investigation should also have a null hypothesis. For this practical investigation the null hypothesis is that there will be no difference in the number of short and long words recalled correctly, and any difference found will be due to chance.

## OPERATIONALISATION

Operationalisation means that you need to make your independent variable and dependent variable specifically defined. The independent variable in this experiment is whether the words are short or long. This will be operationalised by devising a list of ten monosyllabic words and a list of ten polysyllabic words. The dependent variable will be the total number of accurately recalled words from the two lists in a free recall memory test. It is very important that you operationally define both your independent and dependent variables.

## WIDER ISSUES AND DEBATES

### Psychology as a science

Operationalisation is very important to establish objectivity and reliability in psychological research. In this experiment operationalisation has been achieved by defining the type of words each group of participants will receive, and exactly what will be measured as an outcome. With good control over extraneous variables, it is possible to establish a cause-and-effect relationship between the IV and the DV in this experiment.

## EXPERIMENTAL DESIGN

When choosing an experimental design, it is worth considering the strengths and weaknesses of each. An independent groups design is a good design to select if you want to avoid order effects and demand characteristics, but it can mean that the individual differences between participants in each group may affect your results. A repeated measures design avoids individual differences but has the problem of order effects and demand characteristics. For your cognitive practical you are required to use a repeated measures design.



**KEY TERM**

**randomisation:**  
randomising the conditions  
of the study for each  
participant in a repeated  
measures design

In this experiment the aim is to investigate the phonological loop and a repeated measures design is required. This means that all participants will learn and recall a list of short monosyllabic words and learn and recall a list of long polysyllabic words. However, order effects are likely to be a problem if participants are asked to repeat the memory test, particularly immediately after one another, and they may guess the aim of the study if doing in both conditions of the experiment.

When using a repeated measures design for your experiment, it is worth considering using counterbalancing or **randomisation** of conditions. For this practical investigation half of the participants will learn and recall a list of short words, and then learn and recall a list of long words. The other half of the participants will learn a list of long words and then a list of short words.

**SKILLS**

ANALYSIS, CRITICAL THINKING,  
REASONING

**ACTIVITY 1**

Use this table to consider which experimental design is appropriate for your investigation:

Experimental design	Strengths	Weaknesses	Solutions
Independent groups design	No order effects Reduces demand characteristics	Individual differences between groups Requires twice as many participants	Participants should be randomly allocated to conditions
Repeated measures design	No individual differences between groups Requires fewer participants	Order effects may occur Demand characteristics may occur	Counterbalancing could be used A time lapse between conditions could be considered

**SAMPLING**

Selecting a sampling method involves considering your target population and using a sampling technique that draws out a representative sample of people. This means that you can confidently generalise your findings back to the target population. For this experiment, the target population is very large as it can involve any individual with a reasonably intact and unimpaired short-term memory. This means that it would be difficult and time-consuming to use a random or stratified sampling technique, so either a volunteer or opportunity sample would be more efficient.

The volunteer sampling technique encourages participants with a particular compliant nature. This would be a problem for social psychological research but, as cognitive processing is relatively unaffected by personality type and an independent groups design is being used, the volunteer sampling technique is probably more ethical than an opportunity sample. No one is being directly asked and put under pressure to participate.

Ten participants will be selected from the first ten who respond to an advert placed in a sixth-form common room, excluding anyone with short-term memory impairment.



**SKILLS**ANALYSIS, CRITICAL THINKING,  
REASONING**ACTIVITY 2**

Review the sampling techniques discussed on pages 41–43 and copy and complete the following table:

Sampling technique	Strengths	Weaknesses
Opportunity		
Random		
Stratified		
Volunteer/self-selecting		

Now consider which sampling technique would be appropriate for your practical investigation.

**WIDER ISSUES AND DEBATES****Psychology as a science**

In all psychological research, it is very important to use a sample of participants that is representative of the target population. If we do not have a representative sample, we cannot generalise the findings of the experiment to the target population.

**CONTROLS****Situational variables**

Because you are conducting a laboratory experiment, the environment will be reasonably well controlled already. However, it is worth considering any situational variables that are likely to have an effect on participants. In this experiment it would be important to control for any noise or interruptions that might affect learning and recall, so participants will be tested individually, and a sign will be placed on the door to prevent interruptions. To prevent conferring, and therefore the potential for demand characteristics, all participants will be placed in a room, called out individually to do the memory test, and will be told not to return. The procedure will also be standardised to prevent experimenter effects occurring.

**Participant variables**

Using a repeated measures design eliminates individual differences between participants in each condition because the same participants are used twice. However, a short questionnaire will be conducted prior to the experiment to check for any short-term memory problems by asking participants about their educational needs. There will, of course, be participant variables that are not controlled for, such as motivation.

**DEVELOPING A PROCEDURE**

A procedure is a schedule of what happens, where, when and how. This ties into how you will control for extraneous variables and it is important that the procedure stays the same for all participants. In this experiment, participants will be read a set of standardised instructions by the researcher and asked to sit at a desk directly in front of a whiteboard and projector. To prevent demand characteristics, the participants will be told what they will be required to do, but not why they are doing it or what other participants will be doing, so that they do not try harder to remember one set of words over another. The words will be presented one at a time for a duration of three seconds per word. Participants will be given a pen and paper to recall in any order the words they have learned immediately after the words have been presented. They will be given one minute to recall the word list. This standardised procedure will mean that all participants will be treated in exactly the same way and will minimise any experimenter effects.



### Example standardised instructions

Thank you for volunteering to take part in this memory experiment.

You will see a set of ten words appear one at a time on the whiteboard in front of you. Each word will appear for three seconds, and you will need to learn as many as you can. Immediately after the tenth word, you will see a blank screen, this is a cue for you to write as many words as you can remember in any order on the piece of paper in front of you. You may write them down in any order and you will have one minute to remember all the words that you can. You will then be shown another set of ten words which will appear for three seconds each, after which you will see a blank screen as a cue to write down as many words as you can recall in any order.

If you wish to take part, please sign the consent form in front of you. If you do not wish to take part, please let me know now. If you wish to leave the experiment, you are free to do so at any point. This is not a test of intelligence.

Do you have any questions you would like to ask before we begin?

### APPARATUS

Any research into memory typically involves participants learning something, whether it is a list of words, letters or digits, a set of images or a simulated event. Your apparatus will depend on your aim, but it is worth considering the nature of the apparatus you ask participants to remember. A word list may seem fairly straightforward, but you need to remember that some words are easier to remember or more memorable than other words. It may be worth considering using a list of high frequency words, words of similar syllable length (particularly for short-term memory research) or using letters or digits instead.

This practical investigation uses high frequency monosyllabic and polysyllabic words to ensure that each word has equivalent relevance to participants. The words have also been selected for being high frequency, so that each list is equal in familiarity and difficulty.

TABLE 14.1: APPARATUS: WORD LISTS

Monosyllabic words	Polysyllabic words
Cat	Communication
Man	Opportunity
Cup	Imagination
Dog	Organisation
Pen	Responsibility
Sun	Understanding
Hat	Application
Run	Satisfaction
Box	Development
Bed	Determination

### ETHICAL ISSUES

Before undertaking any psychological research it is essential you consider the ethical implications of your research. You should consult the British Psychological Society (BPS) for your practical investigation. You should also consult the British Education Research Association (BERA) guidelines and ethical guidelines relevant to your country and adhere to these



guidelines as closely as possible, even for a small A-level practical investigation. Any research can make participants feel pressured, intimidated, embarrassed or concerned. It is important that ethical issues are given careful thought before proceeding with your experiment. If you are unsure whether your experiment will present any ethical issues, you may wish to conduct a pilot study on family and friends first and ask them how they felt during the experiment.

**SKILLS**

ETHICS, ANALYSIS, CRITICAL  
THINKING

**ACTIVITY 3**

Review the BPS guidelines on page 55 and copy and complete the following table:

Ethical guideline	How would you consider each guideline in your practical investigation?
Informed consent	
Right to withdraw	
Privacy	
Confidentiality	
Protection of participants	

**VALID CONSENT**

In this experiment, participants have been asked to volunteer for an experiment into short-term memory. This is clearly stated on the recruitment advertisement. When deciding on whether to gain fully informed consent for your own experiment, it is worth considering whether knowledge of the aim will affect the performance of participants. Where possible, fully informed consent should be gained or otherwise fully justified, and no offer of incentives should be given for taking part in the investigation.

**Example advert for a psychology experiment**

We are looking for volunteers for a psychology experiment on memory. You will be asked to learn a list of words to remember and recall; this will measure your short-term memory of short and long words. This is an experiment for my A-level practical investigation, which may be used in my exam.

The study will take place in the psychology classroom on Monday morning. You will be required for most of the morning, but the actual memory test will take only five minutes. You will be tested individually and no details of your memory score will be shared with any other participant. You will be told your memory score and the full aim of the study once you have finished. You may use your right to withdraw before, during and after the study has taken place. Your details will be destroyed following my A-level examination.

If you are interested in taking part, please email [memoryexperiment@example.org](mailto:memoryexperiment@example.org)

Because the participants being recruited for this experiment are under the age of 18 years, it is necessary to gain consent from a parent or guardian of the child. In this experiment, details of parents/carers were gained from the volunteers and a consent form was sent out to parents with information about the experiment. You will also need to consider whom consent needs to be gained from if your participants are considered to be children. You should provide an information sheet for both parents/guardians and participants setting out the nature of your experiment.



## RIGHT TO WITHDRAW

In any psychological investigation, it is very important to offer participants a right to withdraw. This means that they can elect to leave the study before, during or after the experiment has taken place. If they withdraw from the study after it has happened, the participant's results should be destroyed. In this experiment, participants were offered a right to withdraw in the recruitment advertisement, the standardised instructions and debrief.

### Example debrief

Thank you for taking part in this psychology experiment into memory.

You were given two lists of ten words to learn and recall. The words you were given are either short or long words. This was to test the capacity of short-term memory. Psychological theory predicts that, because we use rehearsal to hold information in short-term memory, we will be better at rehearsing shorter words as they are quicker to pronounce. Long words will be more difficult to rehearse because they take longer to pronounce.

Your memory test score was X out of ten for short words and X out of ten for long words, which is in the normal range for this type of experiment.

This result will only be used for my A-level practical investigation. Your result will be anonymised, and the data destroyed after the exam. If you feel uncomfortable with this, you may withdraw your results.

Do you have any questions?

Thank you for your time.

## RISK

It is important to consider whether your participants will be protected from harm. Harm can be physical or psychological. Under no circumstances should you physically harm your participants, and you will have to think very carefully about whether they will suffer any psychological harm, even modest harm such as embarrassment or stress. In this experiment participants were reminded of their right to withdraw, the results were anonymised, and they were told that the test is not a measure of intelligence. It is also important that participants are given an opportunity to ask any questions they may have arising from the research. This can help alleviate any anxiety before the test and any embarrassment caused by the test.

### Information sheet contents

The information sheet should contain the following:

- the aim of the study
- the type of data to be collected
- the method of data collection
- confidentiality and anonymity conditions
- compliance with relevant data protection regulations in your country, how the results will be made available and details on destruction of data (GDPR)
- the time commitment participants should expect
- a right to decline or withdraw from the study without consequence
- the possible risk to the participants



- the nature of debriefing
- how the data will be used and the benefits of the study
- the name and contact details of the researcher and supervisor.

(Adapted from the BPS Code of Conduct 2010)

#### Example design decisions taken in an experiment

Aim: to investigate the word length effect on short-term memory.

Experimental hypothesis – directional: more short words (monosyllabic) will be correctly recalled than long words (polysyllabic).

Null hypothesis: there will be no difference in the number of short words (monosyllabic) and long words (polysyllabic) correctly recalled, and any difference will be due to chance.

Experimental design: repeated measures design.

Sampling method: volunteer.

Independent variable: participants receive a list of ten monosyllabic words and a list of ten polysyllabic words (high frequency).

Dependent variable: the total number of accurately recalled words from the lists.

Ethical issues: parental/guardian consent gained, participant consent gained but this was not fully informed. No psychological harm was anticipated. A full debrief was given.

### ANALYSING THE RESULTS

Gather together the results from the participants and present them in a raw data table, like the one in Table 14.2.

TABLE 14.2: RAW DATA TABLE TO SHOW THE RECALL OF MONOSYLLABIC AND POLYSYLLABIC WORDS RECALLED ACCURATELY (OUT OF 10)

Participant number	Total number of monosyllabic words recalled	Total number of polysyllabic words recalled
1	4	3
2	5	4
3	9	4
4	7	3
5	9	5
6	8	5
7	7	6
8	8	3
9	10	4
10	7	5

This raw data indicates that a higher number of monosyllabic words were recalled than polysyllabic words. The raw data seems to support the experimental hypothesis. However, raw data can be difficult to interpret and represents individual scores. To help interpret the findings, descriptive statistics can be useful to present a summary of the average score achieved in a data set. Measures of central tendency, such as mean, median and mode, and measures of dispersion, such as range and standard deviation, should be presented in a summary table, as shown in Table 14.3.



TABLE 14.3: SUMMARY TABLE TO SHOW TYPICAL RECALL SCORE AND DISTRIBUTION OF SHORT AND LONG WORDS RECALLED

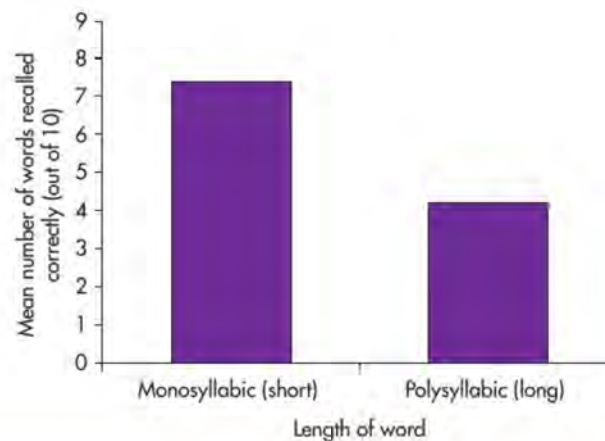
	Monosyllabic (short) words	Polysyllabic (long) words
Median of words recalled	7.5	4
Mode of words recalled	7	4, 5
Mean number of words recalled	7.4	4.2
Range of words recalled	6	3
Standard deviation	1.84	1.03

The measures of central tendency suggest that more monosyllabic words were recalled than polysyllabic words. The measures of dispersion suggest that there was greater spread of results for the monosyllabic words than the polysyllabic words.

**MATHS TIP**

All tables should be clearly labelled and titled to make it clear to the reader what the table represents and what the figures in the table mean.

The mean of words recalled seems to reflect the typical score achieved by participants in both conditions of the experiment, so this statistic can be graphically represented in a bar chart (see Figure 14.1).



► Figure 14.1 A bar graph to show the mean recall of monosyllabic (short) and polysyllabic (long) words

**MATHS TIP**

All graphs should be clearly titled and both axes fully labelled.

If the y-axis scale is particularly large, it is possible to start the axis at a greater number than 0, however, if the y-axis scale is not set at zero, it should be indicated with two intersecting diagonal lines at the lower end of the y-axis scale. This should be done to alert the reader that differences between the bars may appear exaggerated.

Do not present individual scores/raw data in a chart.

**DRAWING CONCLUSIONS**

From the data gathered and presented, it is important that you can draw conclusions from your findings. This can involve going beyond the findings and relating your data to the concepts under investigation. This practical investigation found that participants recalled fewer



polysyllabic words than monosyllabic words. The typical recall score achieved by participants given polysyllabic words was, on average, around three words fewer than for monosyllabic words. However, the distribution of scores suggests that there was some degree of individual variation in recall for both groups, which was marginally greater for the monosyllabic word list.

### INFERENTIAL TEST OF SIGNIFICANCE

To determine whether the findings of the practical investigation are statistically significant, or just due to chance, you will have to run your data through an inferential test. For your practical investigation you will need to gather quantitative data that is at ordinal level or above, and therefore conduct a Wilcoxon non-parametric test of difference. (The Wilcoxon signed ranks test was covered on pages 117–118 of chapter 12).

This practical investigation used a repeated measures design, so a Wilcoxon signed ranks test was run on the data.

### Wilcoxon signed ranks calculation

The Wilcoxon signed ranks calculation was carried out as follows:

- Calculate the difference between two scores by taking one from the other.
- Rank the differences giving the smallest difference rank 1.
- Do not rank any differences of 0 and when adding the number of scores (n) do not count those with a difference of 0, and ignore the signs when calculating the difference.
- Add up the ranks for positive differences.
- Add up the ranks for negative differences.
- T is the figure that is the smallest when the ranks are totalled (may be positive or negative).
- N is the number of scores left, ignore those with a 0 difference.

TABLE 14.4: TABLE CALCULATION FOR THE WILCOXON SIGNED RANKS TEST

Total number of monosyllabic words recalled	Total number of polysyllabic words recalled	Difference	Rank	Rank if positive	Rank if negative
4	3	1	16.5	2	
5	4	1	10	2	
9	4	5	13	8.5	
7	3	4	8	6.5	
9	5	4	13	6.5	
8	5	3	19.5	5	
7	6	1	16.5	2	
8	3	5	6	8.5	
10	4	0	19.5	10	
7	5	2	16.5	4	
				55	0

The total of positive ranks is 55, and the total of negative ranks is 0. The smallest of these is  $T = 0$



TABLE 14.5: CRITICAL VALUES OF T

	Level of significance for a one-tailed test		
	0.05	0.025	0.01
<i>n</i>	Level of significance for a two-tailed test		
	0.1	0.05	0.02
<i>n</i> = 5	0	-	-
6	2	0	-
7	3	2	0
8	5	3	1
9	8	5	3
10	11	8	5
11	13	10	7
12	17	13	9

The calculated value must be equal to or less than the critical value in this table for significance to be shown.

The calculated (observed) Wilcoxon T value is 0. This is less than the table (critical) value at  $p \leq .05$  of 11, with  $N = 10$ . Therefore, the result is significant at  $p \leq .05$  for a one-tailed test. Therefore, the experimental hypothesis can be supported. In fact, the calculated (observed) value is less than the critical value for a one-tailed test at  $p \leq .01$ , meaning that the result is highly significant and therefore the difference between the recall of the groups is unlikely to be due to chance. This means that the likelihood of making a Type 1 error is reduced and the experimental hypothesis can be supported with confidence.

### MAKING A STATISTICAL STATEMENT

Following your statistical test, it is important to make a statistical statement and support or reject your hypotheses. Your statistical statement should include the following information:

- the statistical test used
- the observed/calculated value
- whether a one- or two-tailed test was used
- the level of probability
- the number of participants
- the critical value used
- whether the calculated value was greater than/equal to/less than the critical value
- whether the result is significant or not
- which hypothesis it supported.

#### MATHS TIP

Use this statistical statement template to help structure your conclusion:

The calculated value of the \_\_\_\_\_ test was \_\_\_\_\_.

This was equal to/greater/less than the critical value of \_\_\_\_\_ for a one-/two-tailed test at  $p \leq .05$  with  $n =$  \_\_\_\_\_.

Therefore, the result is/is not significant and the experimental/null hypothesis can be supported, which states that \_\_\_\_\_.



## DISCUSSION

A discussion section of a report will include a summary of the findings and how these relate to the wider concepts, theory and prior research related to the study. It will also include the strengths and weaknesses of the practical investigation and suggestions for possible improvements and new directions for the research.

In this practical investigation it can be concluded that there was a significant difference between recall of short and long words; monosyllabic words were significantly better recalled. This finding is consistent with theory which suggests that the phonological loop has a limited capacity for sound-based information, making longer words difficult to sub-vocalise (rehearse) and maintain compared to shorter words which are quicker to pronounce.

## CRITICAL EVALUATION

It is important to consider both the strengths and weaknesses of the practical investigation. For this, you will be better placed to judge the successes and failures with regard to your own procedure and outcomes. However, a number of general questions should be asked.

- Is the study ethical?
- Can you generalise the findings to others/different cultures/different eras?
- Is the study reliable?
- Is the study carried out in a natural or artificial environment?
- Is the task ordinary?
- Are the findings useful in real life?
- Is the research valid?
- Is there any conflicting evidence from other research?

### Is the task ordinary?

This is a common question asked of much cognitive research conducted in laboratories using series of stimulus lists of words, letters and digits, seemingly unrelated to memory tasks that occur in ordinary everyday life. It is true that we are often required to draw on our memory for shopping lists, telephone numbers or random sequences. However, this is not a typical activity for memory to undertake and often takes a degree of conscious processing and effort. For this reason, the task used in this practical investigation may be criticised for not reflecting an ordinary use of memory.

However, the task was intended to investigate the phonological loop, in a way that actually measured short-term memory in its most pure form, unaffected by the meaningfulness of everyday material. In order to study memory this practical investigation had to remove the social context in which memory normally operates and to remove variables that could potentially confound the research. This can be more easily understood by comparing psychology to biology as a subject. No one would criticise a biologist for collecting blood in a test tube to determine its blood group, yet a test tube is not a natural state for blood to exist. In order for the blood to be tested, it needs to be collected from the body and isolated from contamination. This experiment performed the same function to test phonological encoding.

## SUGGESTIONS FOR IMPROVEMENT

In addition to considering the strengths and weaknesses of your practical investigation, you should also refer to how your study could be improved. To do this effectively you will need to consider the weaknesses of your research and how these weaknesses could be overcome. Suggestions for improvement can be ambitious but should not be impractical or impossible to achieve.



**SKILLS****ANALYSIS, CRITICAL THINKING,  
ETHICS**

When analysing strengths and weaknesses make it clear what caused the issue and its effect on your practical investigation. When making suggestions for improvements suggest a sensible improvement and justify why it would improve your practical investigation.

**ACTIVITY 4**

Evaluate your practical investigation by copying and completing the table below.

	Strengths/weaknesses	Suggestions for improvement
Reliability		
Generalisability		
Validity		
Objectivity/subjectivity		
Ethics		

**WRITING UP THE REPORT**

Psychological investigations are written up following a set of conventions for report writing as shown below.

**Conventions of report writing**

**Abstract:** a summary of the background theory/research, aims, hypotheses, method, results and discussion. This is a short paragraph overview of the entire report.

**Introduction:** an overview of related theories and research in the topic area. The introduction provides a rationale for the current investigation that links prior research to the study aims and hypotheses.

**Method:** a detailed account of the participants, sampling method, apparatus, procedure, controls and ethical issues.

**Results:** a detailed account of the data gathered and its analysis using descriptive and inferential statistics.

**Discussion:** conclusions drawn from the results analysis, reference to prior research, strengths, weaknesses and possible improvements for future research.

**CHECKPOINT**

- Which statement best describes the median as a measure of central tendency?
  - The most frequent score
  - The arithmetic average
  - The middle value in a data set
- Which statement best describes the range as a measure of dispersion?
  - The average score in a data set
  - The difference between the highest and lowest value
  - The mean of the variance
- Why is a pilot study used?
  - To test for significance
  - To check a procedure
  - To validate a finding



4. Which statement best describes a hypothesis?

- a) A research outline
- b) A test finding
- c) A testable prediction

#### SKILLS

ADAPTIVE LEARNING,  
ANALYSIS, COMMUNICATION,  
CRITICAL THINKING, INTEGRITY,  
INTELLECTUAL CURIOSITY,  
SELF-EVALUATION

#### EXAM PRACTICE

- |   |           |
|---|-----------|
| 1. State the aim of your practical investigation in cognitive psychology.   | (2 marks) |
| 2. State one finding of your practical investigation in cognitive psychology.   | (2 marks) |
| 3. Explain one weakness of your practical investigation in cognitive psychology.  | (2 marks) |
| 4. Explain one strength of using the mean to calculate your data in your practical investigation in cognitive psychology. | (2 marks) |



# TOPIC C BIOLOGICAL PSYCHOLOGY



Biological psychology aims to make a direct link between the normal functioning of the body (physiology) and behaviour. In this topic you will explore different biological factors such as genes, the brain and hormones, and how they relate to human behaviours such as aggression. You will also explore the nature of body rhythms, how they are regulated by internal and external factors, and learn about different body rhythms such as the sleep–wake cycle.

Biological research uses correlations, brain-scanning techniques and twin studies to understand the biological basis of human behaviour. You will study these in context as you learn about the classic study by Raine who used brains scans to investigate the brain activity of murderers, and Brendgen's twin study of aggression. You will also have an opportunity to put into practice your knowledge of correlational research when you conduct your own practical investigation into aggression or body rhythms.



# CHAPTER 15 STRUCTURE AND FUNCTION OF BRAIN REGIONS – AGGRESSION

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand the central nervous system (CNS)
- describe the structure and role of the neuron
- explain the function of neurotransmitters and synaptic transmission
- identify brain structures
- describe and evaluate brain functioning as an explanation of aggression
- describe and evaluate the role of hormones and genetics in aggression, and research in these areas.



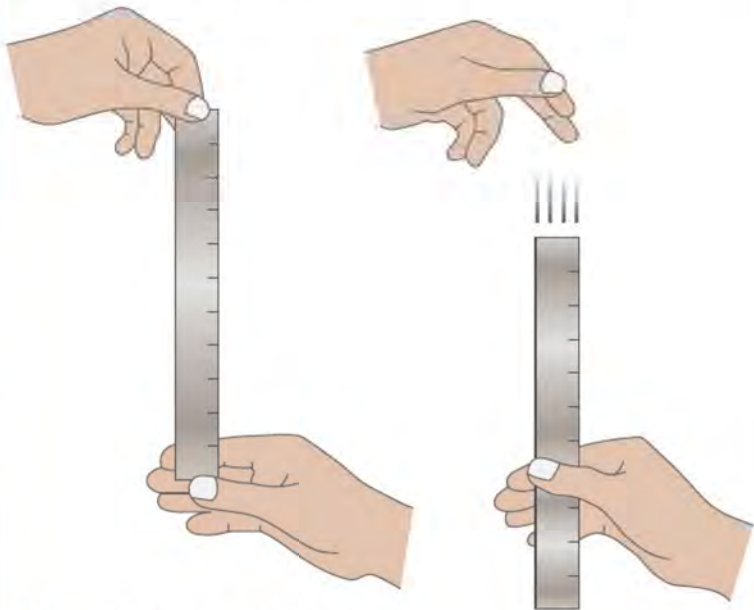
▲ Catching a ball needs quick reflexes

## GETTING STARTED

Investigate your own nervous system using a reaction test. In pairs, one person holds a ruler (with the 0 cm end facing downwards). The other person tries to catch the ruler between their thumb and index finger as it falls (Figure 15.1).

Repeat this five times and calculate the average centimetres taken to catch the ruler.

This simple exercise shows how rapid your nervous system is. The test demonstrates the time it takes for the brain to interpret the visual information of the ruler dropping and then respond by sending a message to the muscles in your hand to contract and catch the ruler.



▲ Figure 15.1 Nervous system experiment

## THE NERVOUS SYSTEM

The central nervous system (CNS) consists of the brain and spinal cord. It is the central processing and control point for all human behaviour. The brain processes all incoming information from the senses and is responsible for controlling behaviour that results from this information. The spinal cord connects the brain to the rest of the body, and allows messages to be passed from the body to the brain, and also from the brain to other parts of the body.



## KEY TERMS

**adrenaline and norepinephrine:** hormones that increase the heart rate, alertness and other functions in preparation to deal with threat

**homeostasis:** process by which the body maintains the internal environment, including blood pressure, blood sugar levels and body temperature

**neuron:** cell within the nervous system

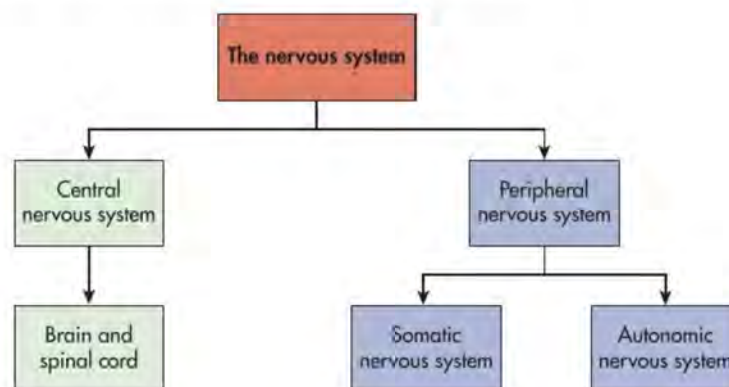
## THE PERIPHERAL NERVOUS SYSTEM

The nerves branching out from the central nervous system (brain and spinal cord) are collectively referred to as the peripheral nervous system. This is responsible for facilitating communication between the central nervous system and the rest of the body.

The peripheral nervous system is divided into the somatic nervous system and the autonomic nervous system. The somatic nervous system is responsible for transmitting sensory information from the body to the brain, and for transmitting motor signals from the brain to the body which cause movement, such as wiggling your toes.

The autonomic nervous system is responsible for regulating involuntary processes, such as heart rate, and maintaining **homeostasis** in the body. The autonomic nervous system has two further divisions: the sympathetic division and the parasympathetic division. The sympathetic division is a set of nerves that prepare the body to deal with a stressful or emergency situation by increasing the heart rate and respiration and releasing **adrenaline and norepinephrine** into the bloodstream. This is often referred to as the 'fight or flight' response. The parasympathetic division is an 'off switch' to the sympathetic division, and works to restore the body to its natural resting state.

Figure 15.2 shows the different divisions of the nervous system.



► Figure 15.2 Divisions of the nervous system

The cells in the central nervous system are known as **neurons** and these cells communicate with around 1 000 other cells at a time in huge networks.

## SKILLS

COMMUNICATION,  
COLLABORATION

## ACTIVITY 1

We have different types of neurons around our body which carry messages to and from our central nervous system. Sensory neurons detect information from outside and inside our body and send this information to the central nervous system.

We have sensory neurons in our skin to detect touch. Investigate these sensory neurons in pairs. One partner should place an object in a bag and the other closes their eyes and feels the object without looking. They then draw what they feel. Swap over.

Repeat, but this time feel an object in a bag using only your foot.

Sensory neurons are closely bunched together in the fingertips, so it should be much easier to draw an accurate picture of the object you felt with your hand. The foot has fewer sensory neurons and these are spread further apart. This makes it more difficult to feel the object and draw it accurately.



## KEY TERMS

**action potential:** the electrical trigger that passes along the axon and stimulates the neuron to activate and release neurotransmitters as a result of synaptic transmission

**axon:** branch from the cell body that passes electrical impulses down to the end of the neuron to allow it to communicate with others

**axon hillock:** area that connects the cell body to the axon

**axon terminals:** end of the axon that leads to the terminal buttons

**cell body:** main part of the cell where the nucleus sits; it also contains mitochondria

**dendrites:** branches at the top end of a neuron that receive messages from other neurons

**mitochondria:** site of aerobic respiration, where energy is released from glucose

**myelin sheath:** fatty deposit that provides electrical insulation for an axon and allows electrical nerve impulses to be passed along

**neurotransmitters:** chemicals that pass messages between neurons

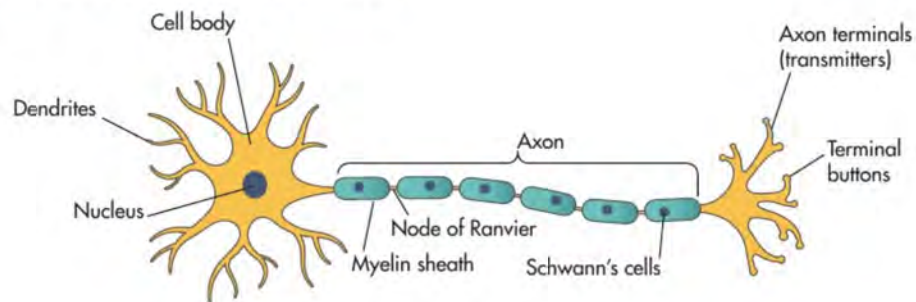
**nodes of Ranvier:** gaps between adjacent myelin sheaths

**nucleus:** houses the genetic material for that particular neuron

**terminal buttons/terminal boutons:** very end of a neuron where the nerve impulse becomes a chemical message that can be passed to the dendrite of another neuron

**vesicles:** tiny sacs that contain molecules of neurotransmitter chemicals

## STRUCTURE AND ROLE OF THE NEURON



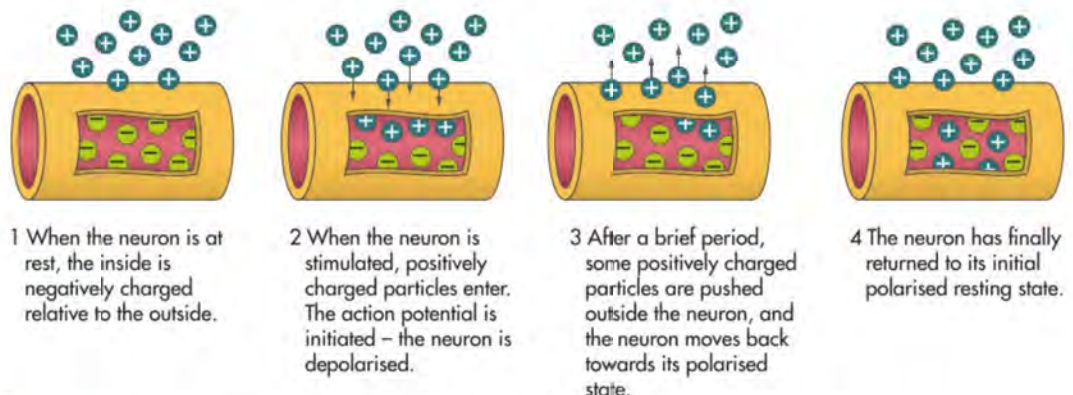
▲ Figure 15.3 Structure of a neuron

A neuron is made up of four main parts (Figure 15.3):

- The **cell body** of the neuron contains the cell **nucleus**, which houses the genetic material for that particular neuron. The cell body also contains other materials that allow the cell to function, such as the **mitochondria**, which provide the neuron with energy.
- Attached to the cell body are **dendrites** that receive messages from other neurons in order to trigger an action potential (an electrical impulse) within the cell.
- Also attached to the cell body is the **axon**, an extension of the cell body that passes the electrical impulse towards the axon terminals. At the top of the axon, attaching the axon to the cell body is the **axon hillock**, which is where the nerve impulse is triggered from. Around the outside of the axon are layers of fatty deposits called **myelin sheath** that provide an insulating layer to the axon and help to speed up the rate of message transmission. There are breaks between the cells along the myelin sheath, which are known as **nodes of Ranvier**.
- At the very end of the axon are the **axon terminals**, and on the ends of these are **terminal buttons** (also known as **terminal boutons**). Action terminals pass nerve impulses from the cell body to the parts of the body that they control or activate – this could be another neuron, or it could be something like a muscle or a gland. These bulb-shaped structures contain tiny sacs called **vesicles** that store **neurotransmitters** ready for the next stage of neural transmission.

## The action potential

The **action potential** refers to the actual method by which the nerve impulse passes down the axon of the neuron to stimulate the release of neurotransmitters. This is a tiny electrical impulse that is triggered by a change in the electrical 'potential' of the neuron itself.



▲ Figure 15.4 An action potential: how a message is carried by the neuron



## KEY TERMS

**excitatory postsynaptic potential:** the temporary depolarisation of a neuron as a result of positively charged ions flowing into the cell that make it more likely to fire an action potential

**inhibitory postsynaptic potential:** changes in the polarisation of a neuron that make it less likely to fire an action potential

**millivolt:** one thousandth of a volt

**postsynaptic neuron:** the neuron where a chemical message travels to

**presynaptic neuron:** the neuron where a chemical message starts from

**resting membrane potential:** the difference in electrical potential (meaning how 'ready' the neuron is for action) on each side of the cell membrane while the cell is at rest

**synaptic gap/cleft:** the tiny space between the dendrite of one neuron and the terminal button of another where chemical messages can be passed

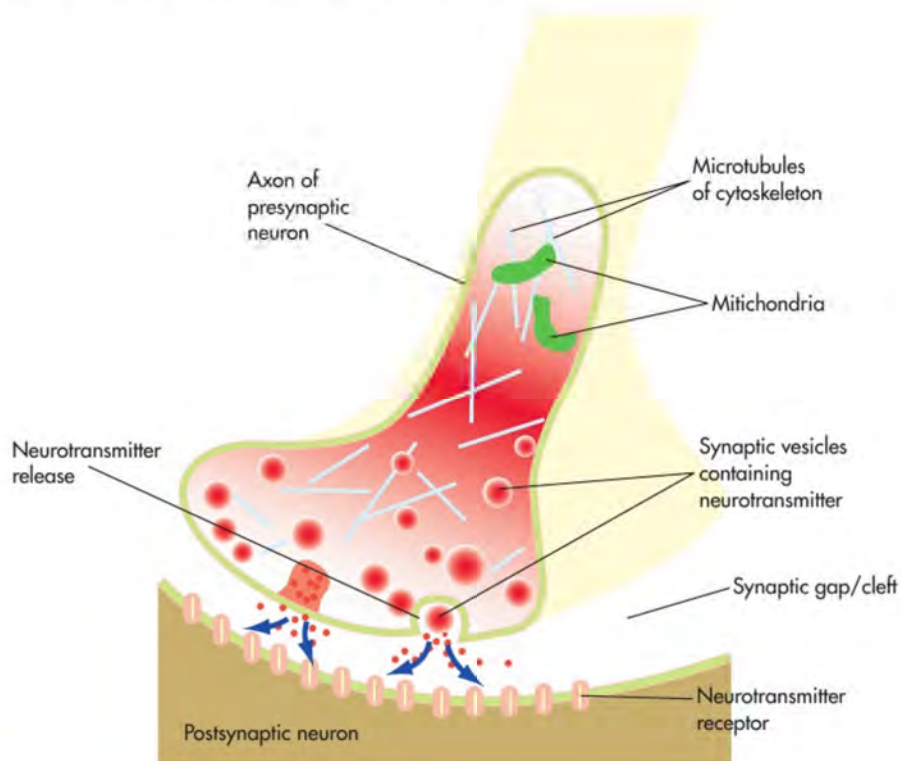
Neurons have a **resting membrane potential** of about **–70 millivolts**, meaning that the inside of the neuron has a slight negative charge in relation to the outside of the neuron. When a neuron receives a message from another neuron, this chemical message can stimulate an **excitatory postsynaptic potential**. This means that it will depolarise the neuron, increasing its internal charge, or it can hyperpolarise the neuron, decreasing its charge and stimulating an **inhibitory postsynaptic potential** making it more difficult for the neuron to generate an action potential.

When a neuron has received enough excitatory messages, or at least more excitatory messages in comparison to the number of inhibitory messages, that are sufficiently strong to reach the neuron's own threshold, an action potential is triggered. This usually happens when the neuron's charge reaches approximately **–55 millivolts**. The action potential sends an impulse along the axon of the neuron towards the axon terminals at the end of the neuron (see Figure 15.4).

## SYNAPTIC TRANSMISSION

The cell's electrical impulse/action potential starts as small electrical impulses generated at the axon hillock, and travels the length of the axon, but once the message reaches the terminal button it turns into a chemical message. When the impulse reaches the axon terminal, the neuron can pass its chemical message to further neurons across the **synaptic gap** (also known as the **synaptic cleft**) – the space between two adjacent neurons. The neuron that is sending the message is referred to as the **presynaptic neuron**, while the one receiving the message is the **postsynaptic neuron**.

Each neuron is responsible for producing a certain chemical, or neurotransmitter, and when the action potential reaches the axon terminal, calcium channels will open – flooding the terminal button with calcium ions. Vesicles containing the neurotransmitter substance will then be released and travel down to the outer membrane of the terminal button, where the casing of the vesicle will fuse with the membrane. This allows the neurotransmitter to be released from its vesicles into the synaptic gap/cleft (see Figure 15.5).



▲ Figure 15.5 The synaptic gap/cleft



The **receptors** on the postsynaptic neuron are designed to bind to a specific neurotransmitter, and when they detect it the neurotransmitter molecule will then be absorbed by the postsynaptic neuron. Any neurotransmitter molecules that have not been absorbed by the receptors of the postsynaptic neuron will be destroyed by enzymes in the synaptic gap/cleft, or they will be absorbed again by the presynaptic neuron in a process known as **reuptake**. These reabsorbed molecules will be reused by the neuron. Once the neurotransmitter is cleared from the synaptic gap/cleft, synaptic transmission is terminated.

Table 15.1 gives a summary of the functions of some of the most common neurotransmitters.

TABLE 15.1: FUNCTIONS OF THE MOST COMMON NEUROTRANSMITTERS

Neurotransmitter	Function
Acetylcholine	Stimulates muscle contractions and has a key function in motor control and movement. It is also necessary for memory and other cognitive functions such as attention and wakefulness/alertness. Acetylcholine is also involved in expressions of some emotions such as anger.
Noradrenaline	A neurotransmitter associated with emotion, particularly in mood control. Noradrenaline is involved in functions such as sleeping and dreaming as well as learning.
Dopamine	A chemical precursor to noradrenaline so their functions are quite similar. Dopamine has been related to emotion and cognitive functions, as well as posture and control of movement. It has also been associated with reinforcement in learning as well as dependency such as addictions. Dopamine is used in hormonal regulation such as control of the menstrual cycle in women.
Serotonin	Most commonly associated with mood control, particularly in the <b>limbic system</b> in the brain. It is involved in many other functions such as feeling pain, sleep, regulating body temperature and hunger.
Glutamate	Involved in motor control, reasoning and decision-making. It is also responsible for strengthening synaptic connections and is involved in balancing excitatory and inhibitory signals in the brain.
GABA	A major inhibitory neurotransmitter in the brain. It plays a role in reducing anxiety and stress, inhibiting pain, and promoting sleep and relaxation. It is the brain's natural braking system working to prevent excessive neural activation.

## KEY TERMS

**cognition:** mental processes, such as thinking

**limbic system:** a set of structures in the brain associated with drives, emotions and mood

**receptors:** sites on the dendrites that are designed to bond to and absorb a specific type of neurotransmitter molecule

**reuptake:** the process by which unused neurotransmitter molecules are absorbed back into the presynaptic neuron to be reused

Some neurotransmitters are excitatory, and increase the positive charge inside a neuron causing action potential (glutamate is an example of an excitatory neurotransmitter). Some neurotransmitters are inhibitory and decrease the charge inside the neuron, making it less likely to cause an action potential (GABA is an example of an inhibitory neurotransmitter).

## WIDER ISSUES AND DEBATES

### Reductionism

Reductionism refers to understanding complex behaviours by breaking them down into simpler elements. This can help us understand the basic cause of a behaviour, but it can also lead to the cause of a behaviour being over-simplified.

One issue with explaining behaviour as a result of the function of neurotransmitters is that it can be considered reductionist, which means it can overly simplify human behaviour when viewing it as a result of synaptic transmission in the brain. Our behaviour is governed by many factors, including environmental factors, **cognition**, social and cultural factors, as well as neurotransmitters. Neurotransmitters should be considered as simply one piece of a larger jigsaw.



## KEY TERMS

**hemispheres:** two symmetrical halves of the brain

**phrenology:** practice of mapping the bumps on a person's skull and using these to deduce aspects of their character

**trepanning:** surgical intervention in which a hole is drilled into the skull to treat problems related to the surface of the brain, such as epilepsy

This skull is from around 3500 BCE and shows evidence of trepanning. The skull also showed traces of anesthetic herbs in the teeth ►

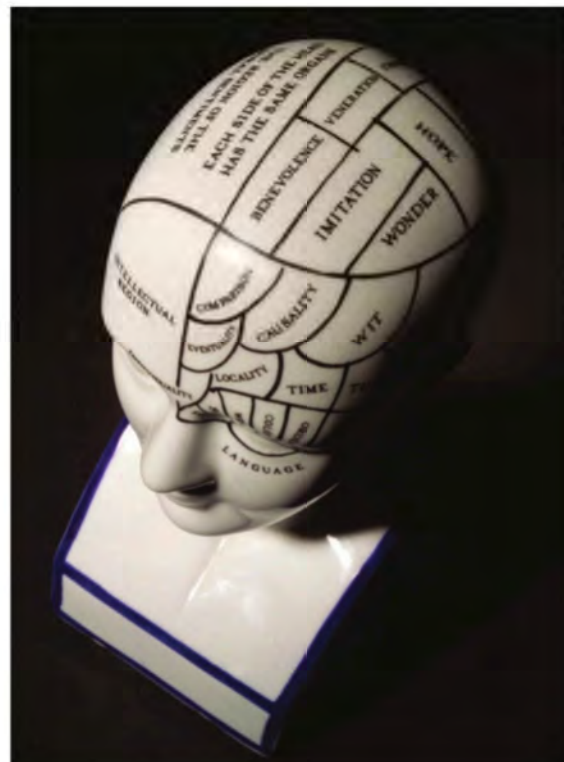
## BRAIN STRUCTURE

## HISTORICAL OVERVIEW

There is evidence that early humans had some basic knowledge about the brain. Fossil evidence shows **trepanning** was used about 10 000 years ago in connection with migraines and epilepsy. Hippocrates, the Ancient Greek physician known as the father of medicine (born in 460 BCE), was familiar with brain injuries and put forward the idea that each side, or **hemisphere**, of the brain served a distinct function.



However, there was little further development in our understanding of the role of brain structure until in the early 19th century when the 'science' of **phrenology** was introduced by Franz Joseph Gall. This 'science' was mistaken in its belief that you could tell someone's character by mapping the bumps on their head, but it at least showed a new direction in thinking that behaviour was in some way linked to the brain.



Phrenology was the 'science' of telling what someone's character was like by looking at the bumps on their head ►



## KEY TERMS

**aphasia:** a disturbance in the comprehension or production of language caused by brain dysfunction or damage, such as a stroke

**lesion studies:** investigations into the effect on behaviour of damage to specific areas of the brain

**lobes:** specific locations in each hemisphere of the brain, frontal – is the front part, temporal is to the side and behind the ears, parietal is the top area and occipital is at the back of the brain (see Figure 15.6). Brains have eight lobes, four in each hemisphere.

**prefrontal cortex:** the front area of the brain situated just behind the forehead

One of the earliest cases that indicated a specific role for brain structure in governing behaviour was that of Phineas Gage, a railway worker in the mid-west of the USA. In 1848 he suffered an unfortunate accident when a tamping iron (an iron rod used for pushing explosives into drilled holes in rock in order to blow them up) set off the explosive and blew the iron rod up through Gage's face and out the top of his head. Over the remaining 11 years of his life, after the accident, it was reported that his personality changed fundamentally – previously he had been a reliable person, but afterwards he was irresponsible and aggressive. His doctor concluded that the damage done to his brain, which included severing the **prefrontal cortex**, had led to the change in his character.

## WIDER ISSUES AND DEBATES

## Generalising from case studies

Generalising from single case studies is problematic. The outcome of an individual case may be a result of a unique set of variables – another person in different circumstances may experience a different outcome. Someone with brain damage similar to that of Phineas Gage may have reacted in a different way. Phineas Gage's change in behaviour could have been due to a reaction to the facial disfigurement he suffered alongside the brain injury. Would his reaction to this disfigurement have been the same without the brain damage? Recently, the Phineas Gage case has been subjected to scrutiny. While there are historical accounts of his personality change following the brain injury, there is limited scientific evidence for this. We know that his frontal lobes were damaged, and there is scientific evidence that damage to the frontal lobes can cause issues with emotional regulation, poor decision-making and impulsivity. This suggests that Phineas may have had difficulties in these areas. However, not everyone with frontal lobe damage is affected in the same way, and so we cannot be sure that any changes were a result of the brain injury. We also have to take into account that this accident happened in 1848, a time with very different social norms to now – perhaps his personality changes were exaggerated or misinterpreted?

The case of Phineas Gage was one of the first investigations into how the structure of the brain affects behaviour. A series of case studies of people who had suffered damage to their brain allowed physicians to start to 'map' the brain. This is not an easy task as superficially the brain appears to be one whole organ with little definition of specific areas beyond the two hemispheres. One example is the work of Paul Broca (1861), a French neuroscientist and physician who treated stroke patients in the 19th century. His most famous case study was that of a patient known as 'Tan' (because he had lost the ability to say any word other than 'tan'). It was revealed through post-mortem examination that an area of Tan's brain had been damaged in the lower part of the left frontal **lobe**. This part of the brain, which came to be named Broca's area, is now known to be responsible for the motor control involved in speech production. Damage to this part of the brain would mean someone could understand speech but would not be able to articulate a reply.

Another part of the brain that was identified early is Wernicke's area. This is named after Carl Wernicke who was a German neurologist working in the late 19th century. Wernicke's area is situated at the rear of the left temporal lobe as it joins with the parietal lobe and is involved with the understanding of speech. Patients with Wernicke's **aphasia** typically can produce speech but it is meaningless; superficially it sounds like speech but it is essentially nonsense as these patients have a problem with language comprehension. Over the years psychologists have built a functional map of the brain using research such as this and case studies.

With modern neuroimaging techniques the task of identifying the different areas of the brain has become easier as we no longer have to rely on **lesion studies** to understand the link between a brain area and behaviour.

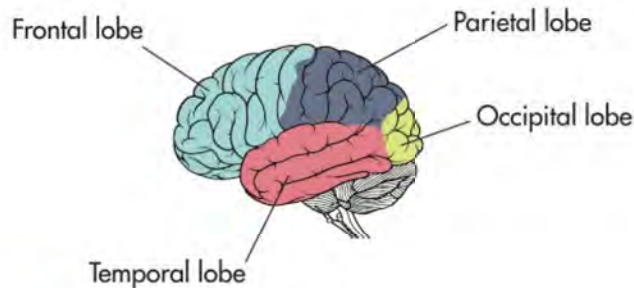
## LINK

The role of the hippocampus in memory is explored on page 159.



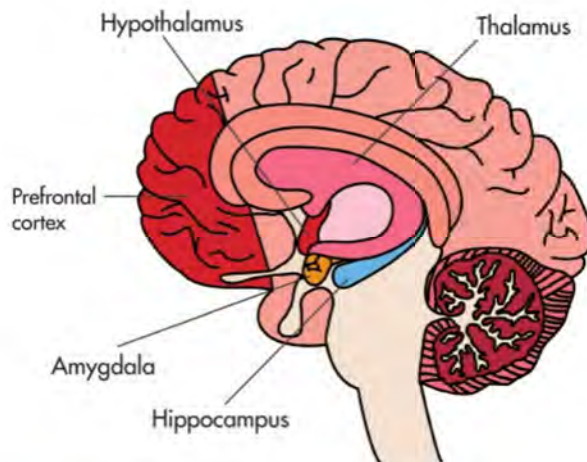
## LOBES OF THE BRAIN

The cerebral cortex of the brain has two hemispheres, one on the left and one on the right. Each hemisphere is divided into four lobes. Each lobe performs a set of specific functions.



▲ Figure 15.6 The structure of the brain

- The frontal lobe is positioned at the front of each hemisphere, and is involved in emotional regulation, problem solving and higher executive functioning, impulse control and motor functions. At the very front of the frontal lobe is an area called the prefrontal cortex which regulates impulse control.
- The temporal lobe is positioned behind each ear, and is involved in processing sound received by the ears and in comprehending language and speech production. The temporal lobe houses a significant part of the limbic system.
- The occipital lobe is positioned at the back of each hemisphere, and is involved in processing visual information received by the eyes.
- The parietal lobe is positioned at the top of each hemisphere, and is involved in processing sensory information and integrating sensory information, and visuospatial processing.



▲ Figure 15.7 The limbic system helps to regulate emotions

## THE LIMBIC SYSTEM

The limbic system is a set of subcortical structures beneath the temporal lobe on both hemispheres of the brain. The limbic system contains the hippocampus, amygdala, thalamus and hypothalamus.

- The hippocampus is responsible for the formation and retrieval of semantic and episodic memory.
- The amygdala processes and regulates emotions, such as aggression.
- The thalamus is a relay station for sensory information; it directs sensory information to various parts of the brain for processing.
- Located below the thalamus is the hypothalamus which regulates the autonomic nervous system and also body rhythms.

### LINK

We explore body rhythms on pages 172–185.

## BRAIN STRUCTURE AND FUNCTIONING AS AN EXPLANATION FOR AGGRESSION

So far we have explored the structure and role of the brain in terms of general functioning. Now we will explore specific areas of the brain that regulate aggression.

### THE PREFRONTAL CORTEX

The prefrontal cortex is an area of the brain that sits right behind the forehead. It is influential in governing social interaction and regulation of behaviour, and is thought to be involved in the suppression of aggressive impulses in the brain. The ability to delay gratification of an impulse is associated with this area. The prefrontal cortex has connections to the amygdala and to the hypothalamus. Damage to this area often leads to problems with anger management, irritability and impulse control.



## KEY TERMS

**antisocial personality disorder:** characterised by a lack of empathy and understanding of others, a disregard for social conventions, impulsivity and aggression

**hormones:** chemicals produced by glands that are used to signal between organs and tissues

**testosterone:** principal male sex hormone and an anabolic steroid

A specific area of the prefrontal cortex called the orbitofrontal cortex, just above the eyes, is believed to be important in decision-making and the prediction of consequences. Successfully navigating our social world depends on making good choices, and damage to this area of the prefrontal cortex has led to changes in social behaviour. In animal research, damage to this area has led to increased aggression and reduced fear. In humans, social behaviour similar to **antisocial personality disorder** has been observed. Individuals with orbitofrontal cortex damage have also been found to have reduced ability to predict the consequences of social interaction and failing to identify the intentions of others, which may lead to misunderstandings and poor decision-making that can escalate into aggression.

## WIDER ISSUES AND DEBATES

## Issues of social control

In the mid-20th century knowledge of brain functioning was used to 'treat' aggressive patients with psychiatric issues by performing a prefrontal lobotomy, an operation that severed the connection between the limbic system and the prefrontal cortex. This was effective in reducing aggression but it also reduced all other emotional reactions too and is no longer regarded as ethical.

## THE AMYGDALA

The amygdala is a structure of the limbic system known for being the centre for emotions, emotional behaviour and motivation. It integrates internal and external stimuli and every sense has an input (ears, eyes, etc.), which when combined gives us an instinctive feeling or reaction to the environment that will include aggression if a threat is perceived. If the amygdala perceives threat, it activates the hypothalamus (see below). If the amygdala is not functioning correctly, it may misinterpret an environmental stimulus, such as a loud noise or situation, as a threat. The prefrontal cortex also connects to the amygdala and damage to this connection may lead to the expression of aggression as it can fail to inhibit an aggressive response.

## THE HYPOTHALAMUS

The hypothalamus is a structure in the limbic system. The role of the hypothalamus is to maintain homeostasis through the regulation of **hormones**, including those that regulate sexual function. The hypothalamus is linked to aggressive behaviour in males via the production of **testosterone**. If the hypothalamus is damaged or not functioning correctly it may not properly regulate testosterone. The hypothalamus also regulates the autonomic nervous system, and can activate the flight or fight response, which prepares the body for rapid action in response to threat.

## THE HIPPOCAMPUS

The hippocampus is not directly involved in the regulation of aggression, however, it can have an indirect influence. The hippocampus is involved in the formation of new memories and has connections with other parts of the brain, such as the amygdala and prefrontal cortex, which are involved in emotional regulation. Memories of past social situations or interactions can shape an individual's response to that situation, including interactions involving aggression.

## EVALUATION OF BRAIN STRUCTURE AND FUNCTIONING AS AN EXPLANATION FOR AGGRESSION

The Phineas Gage study claimed that damage to the frontal lobes caused an increase in aggression; this early research finding suggested a possible biological basis for aggression. However, retrospective reports on his change in behaviour cannot be relied upon fully, and it would be unwise to rely upon unique case studies such as this one, particularly given its age.

## LINK

See the later section in this topic on the role of testosterone and other hormones on pages 167–169.



**LINK**

You will explore Raine's study in more detail on pages 201–204.

**LINK**

You will explore correlation as a research method on page 185.

Brain dysfunction in the frontal areas of the brain has been associated with impulsive aggression in other studies. Blake, Pincus and Buckner (1995) studied and assessed 31 individuals awaiting murder trial or sentencing, and found 20 of them had frontal lobe dysfunction. Adrian Raine et al. (1997) used PET scans to study the brain functioning of 41 violent murderers and found reduced glucose metabolism in the prefrontal cortex compared to a matched control group.

These studies suggest that damage or loss of function in the prefrontal cortex reduces its ability to inhibit aggression. However, research such as this is correlational, so we cannot be certain that prefrontal damage leads to aggression, or whether there are other factors involved. Olivia Choy et al. (2018) conducted experimental research and found that stimulating the prefrontal cortex reduced the likelihood of the participant intending to be aggressive, and increased participants' perception of moral wrongfulness with regards to aggressive acts. This suggests that a causal relationship can be made between the prefrontal cortex and the regulation of aggression. However, this research only establishes a link between prefrontal activation and aggressive intent – it tells us nothing about whether it would change behaviour.

**THINKING LIKE A PSYCHOLOGIST**

The study by Olivia Choy et al. (2018) poses some interesting questions regarding experimental evidence for the role of the prefrontal cortex. Consider how this research can be used to develop intervention programmes to prevent and control aggression in society. Also consider the implications for this form of social control being implemented.

There is evidence for the role of the limbic structures being involved in regulating aggression. The only way that brain structure and functioning can be studied reliably is to cause brain damage or use brain-scanning techniques. We cannot deliberately damage a human brain to investigate aggression for ethical reasons, so much of the research in this area comes from animals, typically rodents and cats.

John Flynn et al. (1970) stimulated different regions of the hypothalamus of cats. **Stimulation** of the **medial** hypothalamus in a cat's brain produced offensive aggression leading them to physically attack another animal. Stimulating the lateral hypothalamus resulted in predatory aggression, such as stalking behaviour. However, we should be cautious when generalising findings from animals to humans when explaining the functioning of the hypothalamus. Nevertheless, some researchers argue that the basics are the same between the species and therefore these experiments are worthwhile.

**KEY TERMS**

**cost–benefit analysis:** a process that any study which uses live animals must go through to assess the benefits of the research against any harm or suffering which the animals might experience

**lesion:** damage (either accidental or deliberate) to the brain that causes areas to die

**medial:** situated in the middle

**stimulation:** artificial activation of brain areas often through use of electrodes giving off small electrical charges

**WIDER ISSUES AND DEBATES****The use of animals in psychological research**

The use of animals in psychological investigations allows for scientific rigour to be applied. More control is possible as the animal can be genetically bred for a specific study and their environment carefully monitored. This removes the chance of extraneous variables affecting the outcome of the study, making the studies using animals extremely well controlled, enabling objective data gathering, leading to clear cause and effect conclusions being drawn. This level of control would not be possible with human participants because of ethical considerations.

However, there are ethical considerations in the use of animals in research into human psychology. Some would argue that such research is immoral as the animals are harmed, for example parts of the brain are **lesioned**. Others would argue that using animals for human benefit in this way is no different from using them for meat or keeping them as pets. Ethical guidelines now ensure that all studies using animals undertake a **cost–benefit analysis**, which clearly shows that any suffering caused to the animal is outweighed by the potential benefit to humanity.



## KEY TERMS

**longitudinal:** data which is collected over an extended period of time such as weeks or years

**psychopathic tendencies:** lacking emotion and remorse, fearlessness and impulsivity

Adrian Raine et al. (1997) found evidence for the role of the amygdala in aggression. In their study of 41 violent murderers, they found asymmetrical activity of the amygdala (lower activity in the left and higher activity in the right). Furthermore, Blair, Colledge and Mitchell (2001) found that many patients with **psychopathic tendencies** have very similar neurocognitive functioning to patients who have suffered damage to the amygdala.

An amygdalotomy is a surgical procedure that involves removing or destroying parts of the amygdala. In a literature review of 13 clinical studies into the effectiveness of using the amygdalotomy to manage aggressive disorders, Maria Mpakopoulou and colleagues (2008) found the improvement in aggressive behaviours varied between 33 and 100 per cent. This supports the role of the amygdala in explaining aggression in humans.

Further research by Eyal Aharoni et al. (2013) on prisoners in New Mexico supports the structural explanation: brain-imaging studies completed before release revealed reliable predictors for reoffending. Specifically, reduced function in the anterior cingulate, a region of the brain sitting behind the prefrontal cortex, was found to be present in reoffenders. Dustin Pardini et al. (2014) also found reduced amygdala volume in a prospective study of offending. Using **longitudinal** data of males with a history of aggression through childhood and into adulthood, brain imaging showed a negative relationship between lower amygdala volume and higher levels of aggression. They suggest that this research could be a useful indicator of persistent offending.

## WIDER ISSUES AND DEBATES

## Determinism

Biological determinism is the view that behaviour is predetermined by biological makeup and that individuals have no free will or choice as to how they behave. This would mean that people with a smaller amygdala and low activity in the prefrontal cortex are destined to be aggressive.

These ideas can be used as a defence for violence with the argument that the aggressive behaviour of some offenders could be genetically determined and/or the result of their biological makeup, as was the case in Raine's research (see pages 201–204.). This could provide an excuse for some people to engage in violence, as they could say that their behaviour is beyond their control and therefore they are not responsible for their violent outbursts. This could limit their willingness to engage in treatments such as anger management programmes, as they might believe them to be futile in the face of biological factors, ignoring the effects of nurture on their behaviour.

There are individual differences which play a role in how testosterone and the amygdala interact. Not everyone responds aggressively to higher levels of testosterone, and the amygdala's response to hormone changes varies between people. It is also the case that the context in which the interaction between testosterone and the amygdala occurs is important.

There are other explanations for aggression which focus on environmental factors rather than biological ones. Social Learning Theory is used to explain how we learn through observing others. For example, if we are exposed to aggressive role models we are more likely to model aggression ourselves. This theory has been supported by experimental research by Albert Bandura et al. (1961) into learned aggression in children. Bandura et al. found that children who were exposed to an adult role model being aggressive towards an inflatable Bobo doll would copy the adult behaviour. This research suggests that aggression is caused by nurture, and not brain functioning.

## LINK

You will learn about social learning theory as an explanation for behaviour on pages 240–243.



Bandura et al. (1961) found that children learned to be aggressive after watching an adult beat up an inflatable Bobo doll



The idea that there is a biological basis for aggression is consistent with the genetic explanation – our genetic blueprint builds our brain structures and therefore people with a genetic blueprint for aggression will have brain structures that predispose them towards aggressive responses. This could explain why, on average, males across all cultures tend to be more physically aggressive than females.

### SKILLS

CRITICAL THINKING,  
COMMUNICATION

### ACTIVITY 2

How do you think widespread knowledge about facts about the biological basis for aggression affects gender expectations or might reinforce potentially harmful stereotypes?

In pairs, write a list of stereotypical assumptions about males and females. Now consider and discuss which stereotypes could have been influenced by facts about biological differences between males and females.

### WIDER ISSUES AND DEBATES

#### Cultural differences

It could be argued that brain structure and functioning as an explanation for aggression is reductionist. It reduces the production of aggressive behaviour and all that entails down to the working of specific neural circuits and ignores other possible causes such as social learning. There are cultures that show much higher than average aggression, such as the Sentinelese tribe, and cultures that show much lower levels, such as the Mountain Arapesh. This is unlikely to be due to differences in brain structure but very likely caused by social learning.



## SKILLS

ANALYSIS, SELF-DIRECTION,  
INTELLECTUAL INTEREST AND  
CURIOSITY

During your study of this topic you will have opportunities to apply your knowledge to different contexts. In the Unit 4 exam you will also be asked to use your knowledge of the topics and approaches to discuss a key question of relevance to society. You will be given a key question and some background information to help apply your knowledge of concepts, theories and research to explain the key question. You should also consider other plausible explanations and develop a 'for and against' argument for the key question you have been given.

## ACTIVITY 3

One key question in society is what makes some individuals more angry than others. A recent study by University of Cambridge in the UK has found that fluctuations in serotonin levels in the brain, which often occur when someone hasn't eaten, affect regions of the brain which regulate anger. Reduced serotonin has been linked to aggression by other research, and this is the first study to investigate how serotonin regulates behaviour and why some individuals may be more prone to aggression than others.

Molly Crockett and Luca Passamonti (2011) took healthy volunteers and altered their serotonin levels by manipulating their diet. On the serotonin depletion day, the volunteers were fed foods which lacked tryptophan, the building block of serotonin. On the placebo day they were given a normal amount of tryptophan. The researchers scanned the volunteers' brains using an fMRI scanner as the volunteers viewed faces with angry, sad and neutral expressions. The fMRI scans showed that low serotonin made communication between the amygdala and frontal lobes weaker than normal serotonin levels. Using a personality questionnaire, they also investigated which volunteers had a natural tendency to be aggressive. In these individuals, weak communication between these areas of the brain made it more difficult to control aggression. Perhaps these individuals are more sensitive to changes in serotonin levels.

Read through this key question and highlight all of the concepts that you have studied during this course. Now go back to your notes and Student Book pages that mention these concepts. Write a brief summary of your knowledge and understanding of each concept and any research about the concept. Link your knowledge and understanding of each concept to this key question. For example, you might highlight the concept 'amygdala'. In your notes you will find that the amygdala is the seat of aggression in the brain which responds to external threat. The key question here describes the amygdala being unregulated due to a lack of serotonin, which may explain why there is a link between serotonin and aggression. Then discuss your key findings with a partner.

## LINK

There is further discussion of fMRI scans on page 196.

## GENETICS AS AN EXPLANATION FOR AGGRESSION

All humans are capable of aggression under certain environmental circumstances, yet there is considerable variation in aggression between different individuals. Investigating whether there is a genetic basis for individual aggression begins with examining whether aggression is a heritable behaviour, that is whether it shared amongst people who share similar genes.

Research has focused on twin studies in order to establish a genetic basis for aggression. Monozygotic (identical) twins share the same genes and are raised in the same environment, whereas dizygotic (non-identical) twins are raised in the same environment but share around 50 per cent of their genes (the same as siblings). By comparing the concordance rates of aggression between monozygotic (MZ) and dizygotic (DZ) twins, we can begin to work out whether aggression is caused by genetics. If MZ and DZ twins are equally concordant for aggression, we can assume that aggression is caused by environmental factors such as upbringing. But if MZ twins show greater concordance for aggression when compared to DZ twins, we can assume that aggression is genetic as they share more genes.



**LINK**

Twin studies are discussed in more detail on pages 197–198.

Research comparing self-reported parent-rated aggression between twins demonstrate a greater concordance between monozygotic twins, which suggests that there is a biological basis for aggression (Table 15.2).

TABLE 15.2: KEY RESEARCH INTO TWIN CORRELATIONS FOR AGGRESSION

	Aggression measure	MZ correlation for aggression	DZ correlation for aggression
Boston twin study (Scarr, 1966)	Parent ratings	0.35	–0.8
California twin study (Rahe et al., 1978)	Self-report	0.31	0.21
London twin study (Rushton et al., 1986)	Self-report	0.40	0.04
Swedish twin study (Eley, et al., 1999)	Parent rating	0.82	0.45
Canadian twin study (Dionne et al., 2003)	Parent rating	0.73	0.24

(Tuvblad and Baker, 2013)

These studies and many others suggest there is, in part, a biological basis for aggression. However, twin studies such as these adopt various different measures of aggression (some use self-reporting, while others use more robust measures) and examine different types of aggression (reactive aggression, defiance, argumentativeness). They also vary in terms of the ages of participants studied, and whether they collect qualitative and/or quantitative data on sex differences.

Other research has focused on detecting a single gene or genes responsible for aggression.

### MAOA GENE

The MAOA gene is responsible for the encoding of the enzyme monoamine oxidase, which breaks down neurotransmitters such as dopamine, serotonin and norepinephrine (noradrenaline).

- Dopamine is a neurotransmitter involved in many activities, such as pleasure, motivation, mood regulation and the stress response. Too much dopamine has been associated with impulsivity and aggression.
- Serotonin is a neurotransmitter associated with mood regulation and impulse control. If serotonin is not regulated correctly (not broken down), high levels of serotonin cause aggression and impulsiveness.
- Norepinephrine is a neurotransmitter that regulates the autonomic nervous system which in turn activates the fight or flight response. High levels of norepinephrine can activate a fight response occurring, and can intensify emotions such as anger and frustration.

If the MAOA gene is faulty, then the monoamine oxidase enzyme fails to break down these neurotransmitters. This gene was first identified by Han Brunner (1993) who studied a large Dutch family who were known to be prone to violence, impulsive behaviour and criminality. The aggressive males of the family were found to have a mutation (a mistake in the coding sequence) in the gene that codes for the enzyme monoamine oxidase.

There are two variants of the MAOA gene: MAOA-H is a high-activity variant, and MAOA-L is a low-activity variant which is sometimes referred to as the 'warrior gene'. MAOA-L is associated with reduced levels of monoamine oxidase enzyme which results in a less efficient breakdown of neurotransmitters.



If an individual carries the MAOA-L variant, they may be more susceptible to aggression because these neurotransmitters are not broken down efficiently.

### WIDER ISSUES AND DEBATES

#### Nature–nurture and the MAOA-L gene

Environmental factors interact with the MAOA-L gene. Individuals with the MAOA-L gene are hypersensitive and more likely to be affected by adverse circumstances, such as childhood neglect, and as such they are more prone to factors that promote aggression. Having the gene itself does not render someone more aggressive, but it makes them more susceptible to aggression given specific environmental factors.

### XXY SYNDROME

Another genetic disorder which has been linked to aggression is XYY syndrome, where males have an additional Y chromosome. XYY syndrome is relatively rare, having a prevalence rate of around one in 1 000 males born with the condition. It is thought to occur due to a random genetic event in sperm production, and as such it is not an inherited condition. XYY is associated with being taller, delayed language development and some behavioural difficulties. Patricia Jacobs and colleagues (1961) identified the XYY karyotype in three per cent of high risk offenders in a high security psychiatric in Scotland, suggesting a disproportionate number of offenders had the genetic condition compared to general population statistics.

### EVALUATION OF GENETICS AS AN EXPLANATION FOR AGGRESSION

In a literature review on twin and adoption research into aggression, Catherine Tuvblad and Laura Baker (2013) conclude that around half of the variance in aggression behaviour in twins is due to genetics and half due to environmental factors. Mara Brendgen et al. (2005) also investigated social and physical aggression in twins, finding a genetic basis for physical aggression.

Rodent research has been used to show how the MAOA gene can influence aggression. MAOA 'knock out' refers to a genetic modification which renders the gene non-functioning. When the MAOA gene is knocked out, the rodent lacks the ability to produce monoamine oxidase enzyme which is important in the degradation of certain neurotransmitters. This results in an excess of these neurotransmitters. Jean Shih and Yung-Yu Chen (1999) found that MAOA knockout in mice caused aggression, and similarly Jordan Godar et al. (2014) bred mice to have a defective MAOA gene which led to higher levels of aggression. Godar et al. (2014) also found that aggression could be reversed in mice by administering drugs which altered serotonin. This offers evidence that aggression is caused by the genes that influence neural transmission in the brain of mice. However, this would be ethically impossible to test in humans as MAOA knockout would cause significant emotional regulation issues and behavioural problems.

Not everyone responds the same way to fluctuations in neurotransmitters in the brain. There are significant individual differences in response to neurotransmitter levels which may render some individuals as more aggressive than others. There is also a complex interaction between neurotransmitters and other cognitive, social and environmental factors. Many initial theories of aggression emphasise socioeconomic factors, such as poverty and social disadvantage as indicators of aggression and antisocial behaviour. Avshalom Caspi et al. (2002) found a significant interaction between low MAOA gene activity and adverse childhood events, such as child abuse, as predictors of later antisocial behaviour. This study highlights the complex relationship between genetics and environmental factors in shaping human aggression. Rose McDermott et al. (2009) also investigated the MAOA gene and suggested that a gene–environment interaction explains aggression.

#### LINK

Brendgen et al. (2005) is discussed in detail on pages 204–205.

#### LINK

McDermott et al. (2009) is discussed in detail on pages 207–10.



Kirstine Stochholm et al. (2012) compared the incidence of criminal activity of men diagnosed with XYY syndrome and XXY (Klinefelter's syndrome) with an age-matched sample of the general population from Denmark between 1978 and 2006. Criminal activity was categorised into different types (e.g. murder, burglary, violence, traffic offences, arson and 'other crimes'). They found a significant increase in criminal convictions amongst XYY males when compared to the control sample, except for traffic offences. However, when the results were adjusted for socioeconomic factors the men were only more likely to commit specific crimes (such as arson).

Alice Theilgaard et al. (1984) conducted a comprehensive series of tests on XYY males compared to control (XY) males, including personality tests, cognitive and emotional tests, and conducted behavioural observations and criminal record analysis. She found that XYY males tended to be taller, more impulsive and slightly more at risk of criminal behaviour. However, not all XYY males exhibit aggressive or criminal behaviour, and the XYY theory of aggression is largely seen as weak given that there are many genetic and environmental factors that influence aggression.

### WIDER ISSUES AND DEBATES

#### Reductionism

While it is clear that genetics have a role to play in explaining aggression, it would be reductionist to consider this factor in isolation as much of the research points to a gene-environment interaction.

### KEY TERMS

**androgen:** chemical that develops or maintains male characteristics

**antenatal:** before birth

**castrated:** when the testicles of a male animal or a man are removed

**endocrine system:** the system of glands that secrete hormone messages around the body using the circulatory system

**glands:** organs of the body that produce a substance that the body needs, such as hormones, sweat, or saliva

**oxytocin:** hormone released by the posterior pituitary gland, which has been shown to increase trust between people

**pituitary gland:** the small organ at the base of the brain, which produces hormones that control the growth and development of the body

### THE ROLE OF HORMONES TO EXPLAIN HUMAN AGGRESSION

Hormones are chemical messengers that transmit information around the body. However, unlike neurotransmitters, they are carried in the blood and operate all around the body – not just in the central nervous system. This means they take longer to work than neurotransmitters and tend to be used to effect longer-term changes. They are produced and excreted by **glands** and the system of glands is called the **endocrine system**.

Hormones affect behaviour and cause physical changes in the body. For example, **oxytocin** is a hormone released by the posterior **pituitary gland**, which has been shown to increase trust between people.

#### TESTOSTERONE AND CORTISOL

Testosterone is an **androgen**; this means it is a chemical that develops or maintains male characteristics. We all have testosterone in our bodies but it is present in a much greater degree in the average male compared to females.

**Antenatal** exposure to testosterone has an organising effect on the developing brain, leading to increased spatial ability and (arguably) competitive aggression. There is also a critical period immediately following birth when testosterone sensitises certain neural circuits, for example, it stimulates cell growth in areas of the hypothalamus and amygdala (Naftoli, Garcia-Segura and Keefe, 1990), which later sets up the action of testosterone as an adult to effect aggression.

Studies that support this tend to come from research done on rodents. Typically male rodents will be **castrated** (which effectively stops the production of testosterone) and their behaviour will be compared with control rodents under various conditions, including threat and competition for mates. Castrated rodents show little or no aggressive behaviour; however, if their testosterone is replaced, for example, by injection, then they will show typical aggressive behaviour. Differences emerge according to the age of rodent at the time of castration.



## KEY TERMS

**adrenal glands:** pair of small glands at the top of each kidney, which produce and release hormones such as cortisol, adrenaline and noradrenaline to help the body respond to stress

**neonatal:** relating to babies that have just been born

If the rodent is newborn, then testosterone injections have a limited effect on their aggression; whereas if they were over ten days old the replacement testosterone quickly brings their levels of aggression back up to normal for uncastrated rodents (Motelica-Heino, Edwards and Roffi, 1993). Injecting **neonatal** female rodents with testosterone made them act much more aggressively when given testosterone as adults compared to control females (Edwards, 1968). This supports the idea that testosterone is implicated in aggressive behaviour and that the sensitisation of neural circuitry after birth is an important factor in the effect of testosterone release.

Cortisol is a stress hormone produced by the **adrenal glands** in response to a physical or psychological stressor. When an individual experiences a stressful event, cortisol levels rise to help the body increase the availability of glucose in the bloodstream, and also interacts with neurotransmitters in the brain, such as serotonin and dopamine, to help regulate mood and impulsivity. High levels of cortisol help individuals remain calm and cautious in stressful situations, and cause a heightened fear response. Low levels of cortisol can reduce the fear response and cause impulsivity.

In the context of aggression, cortisol seems to interact with testosterone, and the balance between cortisol and testosterone in particular may be important in understanding aggression. James Dabbs et al. (1991) found relationships between cortisol and testosterone in a sample of 113 male offenders. While a significant relationship was found between testosterone and aggression, the effect was only found in offenders with low cortisol levels, but not found in offenders with high cortisol levels. Similar observations have been made in clinical population research on children with conduct disorders and adults with psychopathy.

## SKILLS

CRITICAL THINKING,  
INTERPRETATION

## ACTIVITY 4

Identify which category the following key terms belong to: brain structure and function, hormones or genetics. Copy and complete the following table.

Key term	Category: brain structure and function, hormones or genetics
cortisol	
XXY	
amygdala	
MAOA	
testosterone	
hypothalamus	
prefrontal cortex	

## EVALUATION OF HORMONES AS AN EXPLANATION FOR HUMAN AGGRESSION

Human studies generally support the link between testosterone and aggression: for example, boys are, on average, more aggressive than girls; boys have higher exposure to testosterone both pre- and postnatally (D'Andrade, 1966). Testosterone levels increase during the early teens and there is a strong positive correlation with aggressive behaviour and inter-male fighting (Mazur, 1983). However, correlation does not indicate causality and it might be that other variables such as socialisation affect these factors. However, there have been cases where convicted violent offenders have been castrated and this led to a removal of aggression (Hawke, 1951). This seems to lend support to the hypothesis that testosterone is influential in aggressive behaviour, but these studies lack appropriate scientific rigour such as having a control group



## KEY TERMS

**basal model:** model that suggests the testosterone is assumed to be a persistent trait that influences behaviour

**cingulate gyrus:** part of the brain, which is involved in emotion formation

**reciprocal model:** something cannot happen in one part of the relationship without it affecting the other

and fully objective measures of aggression; current ethical standards would prevent such studies taking place.

Testosterone influences aggressive behaviour by effecting changes in neurotransmission, but this is complex. For example, a modulating effect on aggression is produced by serotonin (a neurotransmitter associated with, among other things, mood regulation), increased activity of serotonergic synapses inhibits aggression and low levels of serotonin will increase aggression (Goldman, Lappalainen and Ozaki, 1996).

Understanding which causes what is an issue here. It could be that raised levels of testosterone occur as an effect of being aggressive or achieving dominance – the **reciprocal model** of testosterone suggests that testosterone is an effect of dominance and not the cause of it. Allan Mazur and Alan Booth (1998) found that individual testosterone levels varied across the lifespan according to environmental status; for example being married decreased testosterone levels whereas divorce increased it. The same study, however, found support for the **basal model**, which suggests that testosterone causes a change in a person's aggressive dominance as it found that men with higher levels of testosterone were more likely to be arrested and to use weapons in fights.

Much of the research supporting the view that testosterone is linked to aggression has been conducted on small mammals, such as rodents, with some studies being carried out on primates; this limits the generalisability of the findings from experimental research. For example, the brain areas said to be affected by testosterone serve different functions across species: the **cingulate gyrus** in monkeys is associated with fear-induced aggression, but in dogs and cats stimulation of this area leads to irritability.

Experimental research of this sort cannot ethically be carried out on humans. There are limited case studies of convicted violent offenders being castrated, which support the findings from animal research, but these cannot be regarded as representative of the general population since the perpetrators of such crimes are atypical.

## WIDER ISSUES AND DEBATES

## Social control

Using surgical castration to reduce aggression in male offenders has been subject to ethical scrutiny due to its sometimes forced application, and also because it is an irreversible procedure. Using surgical interventions to manage people's behaviour is an extreme form of social control.

## THINKING LIKE A PSYCHOLOGIST

Reinhard Wille and Klaus Beier (1989) examined the reoffending rate of 104 voluntarily castrated offenders compared to 53 offenders who did not undergo castration. They found that three per cent of the castrated offenders went on to reoffend compared to 46 per cent of the non-castrated offenders. This may seem to suggest that castration works to prevent crime. However, as a psychologist you need to consider other factors which may explain this result. Consider why an offender might volunteer for such an extreme procedure. Do you think they value freedom more than those who were not castrated? Why are some individuals more willing to pay such a high price for freedom, and what will they do to maintain that freedom once they are released? Are they less likely to reoffend, or less likely to want to be caught again and be more cautious in future offending? What about those 54 per cent of non-castrated men who did not reoffend?



The link between cortisol and aggression has been demonstrated by Jack van Honk et al. (2003) who found that low levels of cortisol may result in fearlessness and have been found in individuals with psychopathic tendencies, which may explain why they are not motivated to avoid punishment. Psychopaths also have reduced responsiveness to stress which may explain their lack of fear and impulsive aggressive behaviour. Keith McBurnett et al. (2000) found consistently low cortisol levels in the saliva of some of the 38 boys referred for disruptive and aggressive behaviour over four years. These boys exhibited three times as much aggressive behaviour and were named as most aggressive by peers three times as often as those with higher cortisol measures.

Andren Manigault et al. (2019) tested 32 adult couples engaged in a conflict discussion and competitive reaction time test in a laboratory environment. Aggressive behaviour was recorded by measuring the intensity of noise blast directed at a partner during the reaction time test. Salivary swabs were taken throughout the experiment to measure testosterone and cortisol levels. They found an association between aggression levels and the ratio of testosterone and cortisol, supporting the dual hormone theory of aggression.

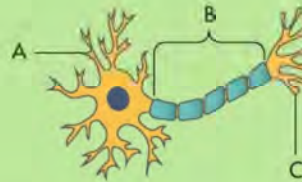
However, much of the research in this area is still ongoing, and there are more complex interactions between brain areas and functioning that are yet to be explained.

### SKILLS

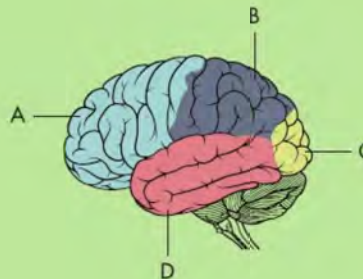
CONTINUOUS LEARNING, CRITICAL THINKING, PRODUCTIVITY

### CHECKPOINT

1. Write down the correct names for the different parts of the neurone which are labelled A, B and C on the diagram.



2. Write down the correct names for the parts of the brain which are labelled A to D on the diagram.



3. Identify which statements are true and which are false.
  - a) The amygdala processes and regulates emotions, such as aggression.
  - b) The prefrontal cortex is responsible for processing visual information.
  - c) The hypothalamus regulates the autonomic nervous system.
  - d) The thalamus is a relay station for sensory information.
  - e) The hippocampus is responsible for higher order thinking and decision-making.



**EXAM TIP**

As well as being able to describe the role that the brain, genetics and hormones play in explaining aggression, you should also be prepared to explain why someone is aggressive. This is an application-style question that requires you to apply your knowledge to explain why someone is aggressive in a given scenario.

**SKILLS**

ANALYSIS, PROBLEM SOLVING,  
CRITICAL THINKING

**EXAM PRACTICE**

1. Raahim fell from his horse and a brain scan showed that his limbic system had been damaged. Since the accident Raahim has become more aggressive and argues with his family and friends. During an argument at home, he hit his younger sister and was punished by his parents. Raahim has also been told to leave the horse riding club for throwing his riding hat at another rider.
  - a) Describe how damage to the limbic system may cause the increase in aggression shown by Raahim. (4 marks)
  - b) Explain one strength and one weakness of damage to the limbic system as an explanation of Raahim's aggression. (4 marks)
2. Adeola is a clinical psychologist working with schools and families who need help with anger management issues. Adeola has assessed a family who has been referred by the school because some of the children in the family have been aggressive at school. Adeola reports that the children often fight with each other and have been getting into physical fights with peers in and out of school. She assesses both parents and finds that the father frequently shouts at the children and often throws objects in the home.
  - a) Describe the role genes may play in the family's aggression. (3 marks)
  - b) Explain one weakness of the role of genes in explaining the family's aggression. (2 marks)
3. Kazuhito is 15 years old and in the adolescent stage of development. Kazuhito has started getting into fights at school which have involved the school calling the police. His parents report that he has been aggressive towards them at home and that he has broken objects in his bedroom when angry.
  - a) Describe the role that one hormone may play in Kazuhito's aggression. (2 marks)
  - b) Describe the role of the prefrontal cortex as an explanation of aggression. (3 marks)
4. Evaluate brain functioning as an explanation of aggression (8 marks)



# CHAPTER 16 BODY RHYTHMS

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- understand the nature of body rhythms
- explain the role of internal pacemakers (body clock) and external zeitgebers in the regulation of the sleep–wake cycle, and research in this area
- describe and evaluate infradian rhythms including the menstrual cycle, and research in this area
- explain seasonal affective disorder and therapies to treat seasonal affective disorder, including light therapy.

## GETTING STARTED

In this chapter you will learn about different natural rhythms of the body. In pairs, identify which body rhythm each description is referring to:

- a 24-hour rhythm that everyone has which involves two different phases, and without which we get extremely tired and lose concentration
- a rhythm of contractions and relaxations of a muscle that moves blood around the circulatory system
- a rhythm of inhaling and exhaling air in and out of the lungs to provide the body with oxygen and remove carbon dioxide
- a recurring monthly rhythm present in females which prepares the body for reproduction
- a rhythm that occurs around three times a day to provide the body with nutrients
- an annual rhythm that involves some animals undergoing a period of rest during the winter months
- a rhythm where animals move to different locations for food, warmth and reproduction.

Once you have identified which body rhythm each description is referring to, consider and discuss what factors might alter or influence each rhythm.

## BODY RHYTHMS

Body rhythms are natural, recurring patterns or cycles that occur in various biological processes within the body. There are various types of body rhythm and they are typically categorised according to the duration of the cycle.

*Circa* is Latin for 'around'.  
*Dian* is from the Latin 'diem' meaning 'day'.  
*Circadian* means 'around a day'.  
*Ultradian* is 'less than a day'.  
*Infradian* is 'more than a day'.  
*Circannual* is 'around a year'.

- Circadian rhythms occur over a 24-hour cycle, such as body temperature and the circadian sleep–wake cycle.
- Ultradian rhythms occur within less than a 24-hour period, such as eating and the stages of sleep in a night.
- Infradian rhythms occur over a longer than 24-hour period, such as the menstrual cycle lasting around 28 days.
- Circannual rhythms occur over a year, such as hibernation, migration and seasonal affective disorder.

### LINK

An example of research into factors affecting the sleep–wake cycle was conducted by Hoefelmann et al. (2006) – this is discussed in more detail on pages 210–213.

These rhythms are regulated by an internal body clock, known as an internal pacemaker, and influenced by external cues, known as exogenous zeitgebers (external time-givers), for example light. Disruption to body rhythms can cause physical and psychological problems.



In this chapter you will learn about the circadian sleep–wake cycle and the infradian menstrual cycle.

### THE CIRCADIAN SLEEP–WAKE CYCLE

The typical human experiences a period of sleep and wakefulness every day (24 hours). This cycle of sleeping and being awake is regulated by an internal pacemaker called the suprachiasmatic nucleus (SCN). The SCN is a cluster of neurons located in the hypothalamus, (see Figure 16.1) and its role is to act as a clock or timer that maintains the sleep–wake cycle. The SCN contains cells which are receptive to light. When light in the blue–green spectrum is received by a specialised group of retinal cells, this is detected by the SCN, and in response to this the SCN influences the **pineal gland** to suppress the production of melatonin. When darkness falls, the decrease in light levels is detected by the SCN which signals to the pineal gland to produce melatonin. **Melatonin** is released into the bloodstream and promotes drowsiness. So while the sleep–wake cycle is regulated by the SCN, it seems to be reset or synchronised by the light levels we experience. It is also reset by other external zeitgebers, such as mealtimes.

Light is the main external/exogenous zeitgeber for the sleep–wake cycle, but it is not the only one to influence the circadian sleep–wake cycle. External temperature, exercise and mealtimes can also cue us to sleep and wake.

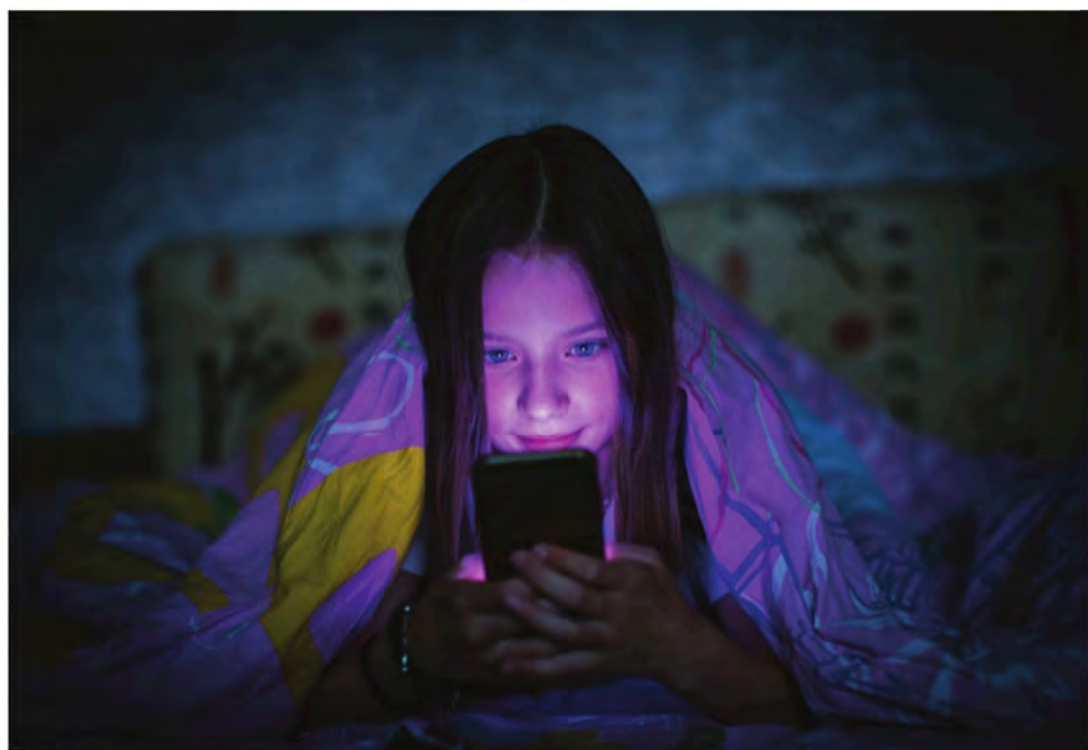
#### KEY TERMS

**melatonin:** a hormone produced by the pineal gland which regulates the circadian rhythm

**pineal gland:** a brain structure which receives information about light and darkness from the environment. It responds to darkness by secreting melatonin

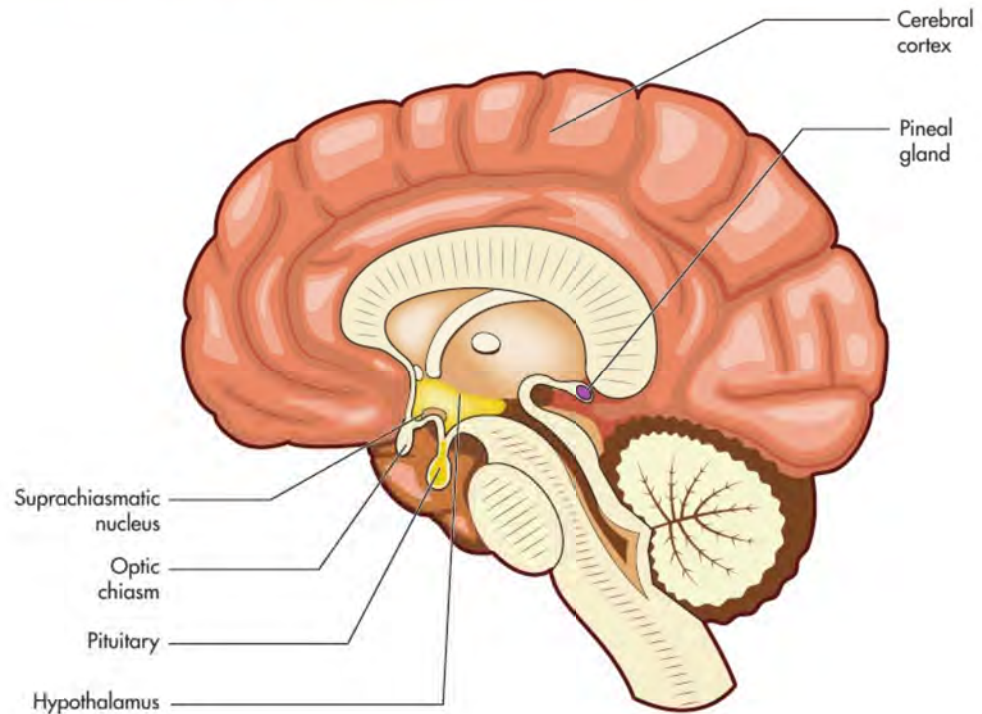
### THINKING LIKE A PSYCHOLOGIST

If we understand that light levels influence the internal pacemaker that regulates sleep, we can begin to understand how sleep can be promoted by reducing light levels. How would you explain this to someone who reports that they do not get enough sleep? What advice would you give them to promote more sleep? Consider sources of light (especially blue light) which we use every night, such as mobile phones and televisions.



▲ Using devices at night which are sources of blue light can disturb sleep patterns





► Figure 16.1 The location of the SCN

### Variations in the sleep–wake cycle

Levels of melatonin produced by the pineal gland fluctuate throughout life. Newborn babies under three months of age do not produce any or very little melatonin for themselves; instead they receive it through breastmilk. From three months of age to puberty, melatonin levels continue to rise, but then decline through puberty (which explains why teenagers stay up late at night), until it evens out in early adulthood. Melatonin levels remain fairly stable until around 40 years old and then steadily decline, which may explain why older people wake earlier. These fluctuations show how the circadian sleep–wake cycle varies throughout life.

There are differences between individuals when it comes to the circadian sleep–wake cycle. Some are ‘morning people’ and prefer to rise early and go to bed early as they are more alert in the early hours. Others are ‘evening people’ and prefer to rise later and sleep later as they are more alert in the later hours.

People also experience variations in the circadian sleep–wake cycle because of their lifestyle. For example, shift workers required to work at different times of the day and night find it difficult to maintain a regular sleep–wake cycle. Travel can also affect the circadian sleep–wake cycle, particularly if we travel to different time zones which are in conflict with our internal pacemaker. Variations in the sleep–wake cycle can also happen as a result of certain medications or types of drinks. For example, caffeine is a stimulant that interferes with melatonin function.

### EVALUATION OF THE CIRCADIAN SLEEP–WAKE CYCLE

The circadian rhythm is internally regulated by the SCN as an endogenous pacemaker, and exogenous zeitgebers. They work together to maintain a normal sleep–wake cycle. Research into both factors can be used to evaluate the circadian sleep–wake cycle.

#### The role of the SCN as an endogenous pacemaker

The role of the SCN in regulating the sleep–wake cycle has been researched using animals. Patricia DeCoursey and colleagues (2000) used radio collars to study the survival rates of free-living eastern chipmunks living in the Allegheny Mountains in the USA.



In this study, 30 of the chipmunks received surgical lesions to the SCN, 24 had surgery not affecting the SCN and 20 were intact controls. They found that a significantly higher proportion of SCN-lesioned chipmunks were killed by weasels during the first 80 days following release. The SCN-lesioned chipmunks showed increased nocturnal movement in their dens which served to attract the weasel predators. This research demonstrates the importance of the SCN in controlling the sleep–wake cycle, as damage to the SCN causes disruption to the circadian rhythm.

Further research by Martin Ralph et al. (1990) demonstrated the role of the internal pacemaker in maintaining the circadian rhythm. A graft of the SCN from a donor hamster was transplanted in a hamster whose SCN had been destroyed. Not only did the transplant restore the circadian rhythm in the hamster, it also adopted the same circadian rhythm as its donor. This gives evidence that the SCN is the internal pacemaker controlling the timing of the sleep–wake cycle.

While this research is indicative of the role of the SCN, we should be cautious when using animal research to explain the regulation of the human circadian sleep–wake cycle. Also, whilst we know that the SCN exerts a considerable influence over the circadian rhythm, we also know that there are other internal pacemakers, such as **peripheral oscillators** located around the body which regulate bodily processes such as liver function and digestion.

### KEY TERM

**peripheral oscillators:** biological clocks in various organs and tissues around the body which are synchronised with the SCN to regulate the circadian rhythm

### WIDER ISSUES AND DEBATES

#### Animal ethics

Research that deliberately destroys parts of an animal's brain, or puts them at risk of harm or even death, may be ethically questionable. For example, research by DeCoursey and colleagues exposed the chipmunks to predation as a result of surgical lesioning to the SCN destroying their sleep–wake cycle. Animal research demands that a cost–benefit analysis is conducted before animals are put at risk of harm. Many factors need to be considered, such as the likelihood of benefits gained from conducting the research. Understanding the role of the SCN in regulating our circadian rhythms should yield a benefit to humans for the research to be justifiable.

### The role of exogenous zeitgebers

The importance of external/exogenous zeitgebers in regulating our sleep–wake cycle has been investigated using studies that remove external time givers, such as light.

French geologist Michel Siffre (1962) set up camp in a cave in the French Alps, 130 metres below surface level. The cave had no natural light, and he did not have a watch, so Siffre had no way of knowing whether it was day or night. Siffre wanted to investigate whether the circadian sleep–wake cycle would be affected by the absence of external zeitgebers, such as the sun and an awareness of the time. Without external zeitgebers, Siffre's endogenous pacemaker would be 'free-running'. Siffre descended into the cave on 16 July 1962 and was due to ascend on 14 September, two months later. When he was notified to resurface from the cave, Siffre thought it was only 20 August. While in the cave, Siffre slept and woke when he felt like it, and it was found that his sleep–wake cycle was slightly longer than expected at around 24 hours and 30 minutes. In the absence of external zeitgebers, the internal pacemaker regulates sleep and wakefulness on its own, but in a slightly longer cycle. In 1972 Siffre repeated his study, this time in Midnight Cave in Texas and for six months. Twice he adjusted to a 48-hour sleep–wake cycle, having 36 hours of wakefulness followed by 12 hours of sleep. This research demonstrates the role that external zeitgebers play in resetting our SCN to maintain a regular sleep–wake cycle.



While case studies such as Siffre are important in understanding the role of the internal pacemaker and external zeitgebers in regulating the circadian sleep–wake cycle, we cannot base our knowledge on a sole participant, particularly as he was in his later years, and suffered extreme loneliness during the isolation. This may limit the generalisability of this research in explaining the influence of zeitgebers on our internal pacemaker. However, Jürgen Aschoff and Rütger Wever (1962) studied participants who existed in a Second World War bunker devoid of natural light for three to four weeks and found that 85 per cent adjusted to a sleep–wake cycle of between 25 and 27 hours. This result seems in agreement with Siffre that our free running endogenous pacemaker runs a little longer than 24 hours, and we need light to synchronise our body clock to our environment.

**SKILLS****EXECUTIVE FUNCTION, ANALYSIS****ACTIVITY 1**

Answer the following questions.

1. Under normal day/night conditions, what is the normal length of the circadian rhythm?
2. In the absence of exogenous zeitgebers, is the length of the circadian rhythm shorter or longer than normal?
3. Name two studies which demonstrate that the free-running circadian rhythm is different without exogenous zeitgebers.

Diane Boivin et al. (1996) used varying light intensities to phase shift the internal pacemaker from its normal cycle. Phase shifting an internal pacemaker involves altering the timing of a circadian rhythm to a new schedule by adjusting external zeitgebers, such as light. This can be done intentionally using experiments, but can also occur naturally as we cross time zones or undertake shift work. There are two different phase shifts:

- Phase delay involves shifting the internal pacemaker to a later time, for example if you travel west to a different country, where the time zone is behind your own country, you will have to delay going to bed.
- Phase advance involves shifting the internal pacemaker to an earlier time, for example if you travel east to a different country, where the time zone is in front of your own country, you will have to go to bed earlier.

Research has also shown that when the endogenous pacemaker is desynchronised by altering light phases, we struggle to adjust. Simon Folkard et al. (1985) recruited 12 healthy student volunteers to participate in an isolation study. In four groups of three students, they were isolated from all external zeitgebers except a clock for three weeks. The students were asked to go to bed at 11:45 p.m. and an alarm woke them at 07:45 a.m. For the first four days the clock maintained the correct time, but then the researchers covertly adjusted the clock to run 20 minutes faster each day until a 23-hour day was reached. After this the clock ran ten minutes faster each day until a 22-hour day was reached. For the first nine days, while the clock maintained normal to an adjusted 23-hour day, the students' sleep–wake cycle synchronised to the clock as a zeitgeber. When the clock was sped up to 22-hour days, the students failed to adjust and their sleep–wake cycle averaged 25.48 hours. This suggests that the free running endogenous pacemaker cannot be easily desynchronised by external zeitgebers.

The importance of exogenous zeitgebers was also been supported by Debra Skene and Josephine Ardent (2007) who found that while partially sighted individuals have a normal sleep–wake cycle as they can perceive some light, fully blind individuals with no light perception suffer from daytime sleepiness, daytime napping and a poor night's sleep.



The inability to detect light as an exogenous zeitgeber results in a desynchronised circadian sleep–wake rhythm.

One important real-life application of research into the role of external zeitgebers is the potential to develop treatments to help people with disruption to their circadian sleep–wake cycle resynchronise their body clocks. Shift workers work unsociable hours (late, early, night), which causes extreme tiredness and puts them at risk of workplace injury and accidents through lack of alertness. Using artificial light in the workplace can reduce the problems of circadian disruption. Travelling across time zones can also disrupt the circadian rhythm which can result in jet lag. It can be helpful to gradually shift your sleep schedule to adjust to the new time zone before travelling. Modern living can also disrupt the sleep–wake cycle with the extended use of computers, mobile phones and televisions which all produce artificial light that can interfere with melatonin suppression. It is recommended that light filters are fitted on devices to reduce exposure to blue light.

There is also evidence that disruption to the circadian rhythm can affect emotional well-being. Exposure to natural daylight is critical in regulating a normal circadian sleep–wake rhythm, so when there is reduced daylight, such as in the winter months, it can lead to a loss of energy and depression, which can lead to a disorder called seasonal affective disorder (SAD).

#### LINK

Treatments for SAD are discussed further on pages 182–184.

#### SKILLS

CRITICAL THINKING, EXECUTIVE  
FUNCTION

#### ACTIVITY 2

Answer the following questions:

1. Name three factors which can disrupt the circadian rhythm.
2. Describe three ways that circadian disruption can be reduced.

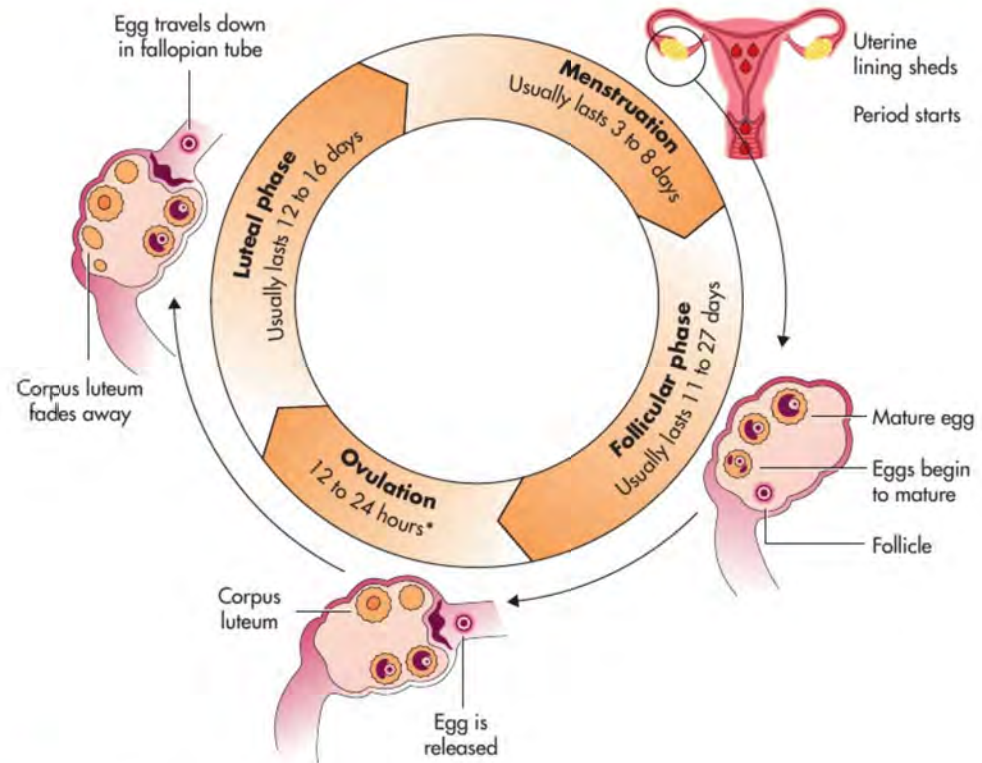
#### INFRADIAN RHYTHMS

Infradian rhythms are those which last longer than 24 hours, so are slower cycles than the circadian rhythm. The menstrual cycle is one infradian rhythm which is around 28 days in females. Other cycles are longer, such as hibernation and migration in animals occurring annually. In humans, seasonal affective disorder is an infradian rhythm characterised by a decline in mood in the autumn and winter months, and an improvement in mood in the spring.

##### The menstrual cycle

When females reach puberty they begin the menstrual cycle, which is a recurring cycle over the month involving physical changes that prepare a female for pregnancy. The menstrual cycle begins with a menstruation or bleeding phase where the lining of the uterus sheds. Menstruation can last around five to seven days. Following menstruation, the pituitary gland releases follicle-stimulating hormone (FSH) which stimulates ovaries to produce eggs. The hormone oestrogen is at its lowest on the first day of the menstrual cycle, and gradually increases as the eggs mature. Half-way through the menstrual cycle, ovulation occurs where the ovaries release a mature egg into the fallopian tube where it can be fertilised by sperm. Progesterone is released to prepare the uterine lining for implantation of the fertilised egg. If the egg is not fertilised, the levels of oestrogen and progesterone fall, which leads to the lining of the womb being shed. The cycle is then repeated (see Figure 16.2).





▲ Figure 16.2 Stages of the menstrual cycle

The menstrual cycle is controlled by the interaction of hormones and the hypothalamic-pituitary-gonadal (HPG) axis within the body which act as internal pacemakers for this infradian cycle. The hypothalamus releases gonadotropin-releasing hormone, which stimulates the pituitary gland to secrete follicle-stimulating hormone and luteinising hormone. Follicle-stimulating hormone triggers the development of eggs and production of oestrogen, and luteinising hormone triggers the release of the egg during ovulation. After ovulation, progesterone is released to prepare the uterine lining for implantation and, if this does not occur, then the hormone levels drop. This means that the internal pacemakers controlling the menstrual cycle form a feedback loop at each stage of the process.

Fluctuations in the hormones oestrogen and progesterone can influence a woman's mood during the menstrual cycle. Premenstrual syndrome (PMS) can occur in some individuals, making them experience mood swings and irritability in the days leading up to menstruation as a result of hormone changes. For some people, these hormonal changes can lead to symptoms of depression, an extreme form of PMS known as premenstrual dysphoric disorder. Hormone changes can also lead to issues maintaining attention, memory problems, changes in appetite and pain sensitivity.



**WIDER ISSUES AND DEBATES****Nature–nurture**

Research into infradian rhythms, such as the menstrual cycle, can be considered to be on the nature side of the nature–nurture debate. This position ignores the many other reasons why individuals behave differently, which cannot be explained by biological processes alone. For example, women may experience low mood because of the social conditions in which they exist. Gender inequality and the stress it places on women is a factor that should not be overlooked. When considering the causes of depression, it is important to consider both biological and social factors.

**SKILLS****CRITICAL THINKING, PROBLEM SOLVING, SELF-DIRECTION****ACTIVITY 3**

Put these statements in the correct order to describe the menstrual cycle:

1. The pituitary gland releases follicle-stimulating hormone (FSH) to stimulate the ovaries to produce eggs.
2. If the egg is not fertilised, the levels of oestrogen and progesterone fall, which leads to the lining of the womb being shed.
3. Menstruation or bleeding occurs for around 5–7 days, where the lining of the uterus sheds.
4. Ovulation occurs where the ovaries release a mature egg into the fallopian tube where it can be fertilised by sperm.
5. The cycle begins again.
6. Progesterone is released to prepare the uterine lining for implantation of the fertilised egg.

**EVALUATION OF INFRADIAN RHYTHMS**

As with other biological rhythms, the infradian rhythm is influenced by both internal pacemakers and exogenous zeitgebers. Research into both factors can be used to evaluate the infradian rhythm.

**Internal pacemakers for the menstrual cycle**

Research into the female menstrual cycle has made a significant contribution to understanding female fertility. The first in vitro fertilisation (IVF) clinic was established in Manchester, England, leading to the birth of Louise Joy Brown in 1978. In the USA, Georgeanna and Howard Jones established their first in vitro fertilisation programme, leading to the birth of Elizabeth Carr in 1981.

The internal regulation of the menstrual cycle is well supported by scientific evidence related to female reproduction and hormonal changes. It is well established that the menstrual cycle is defined by specific hormonal changes, such as the rise and fall of oestrogen and progesterone, at certain phases of the cycle. While the discoveries of oestrogen and progesterone date back to the early 1920s, endocrinologists Georgeanna and Howard Jones are reported to be the first to track oestrogen and progesterone levels through the menstrual cycle.

Evidence for the internal regulation of the menstrual cycle also comes from research into birth control and infertility. Birth control can involve hormonal contraceptives which are based on an understanding that hormones regulate the menstrual cycle. The combined oral contraceptive pill contains synthetic forms of oestrogen and progesterone which cumulatively suppress ovulation. Hormonal contraceptives are highly effective in preventing pregnancy by suppressing the normal internal pacemakers involved in this infradian rhythm.

Rudolph Moos et al. (1969) found that changes in menstrual symptoms (pain) and mood (anxiety) changed in relation to what phase of the menstrual cycle the females were in. This was consistent across the 15 females studied, suggesting that the menstrual cycle is an internally regulated infradian rhythm.



Havva Saglam and Fatma Basar (2019) found a relationship between premenstrual syndrome (PMS) and anger in a cross-sectional study of 720 women living in the province of Kutahya, Türkiye. Of the 49 per cent of women experiencing PMS, higher anger scores and lower control of anger scores were found. However, this research is correlational and therefore we cannot conclude that PMS causes anger, as there could be other interacting variables such as stress and other environmental factors.

### Exogenous zeitgebers for the menstrual cycle

While the menstrual cycle as an infradian rhythm is known to be internally regulated by hormones, it is also known to be influenced by external zeitgebers, such as stress, temperature, nutrition and disruption to the circadian rhythm. Ming-Chieh Lin et al. (1990) studied 16 females with extended menstrual cycles of around 48 days. Lin et al. introduced nocturnal electric light to seven of the females in the form of a white bedside light on days 13–17 of their cycle, which was found to adjust them to a 33-day infradian rhythm. This suggests that light can be an exogenous zeitgeber for the menstrual cycle, and could lead to potential treatments for females with extended cycles.

Susan Labyak et al. (2010) studied 68 nurses working shifts to examine whether shiftwork had an impact on menstrual functioning using self-report measures. The study revealed that 53 per cent of the nurses reported menstrual changes when working shifts and reported taking longer to get to sleep, in addition to sleeping less. Disruption to the circadian rhythm seemed to have an impact on the menstrual cycle. Furthermore, Gunnar Ahlborg et al. (1996) found that Swedish midwives who worked shifts had reduced fertility compared to midwives who worked days. However, disruption to the circadian rhythm alone may not be a direct cause of menstrual cycle changes, as working shifts can also lead to other lifestyle choices such as consumption of caffeine and poor diet.

#### KEY TERM

**pheromones:** odourless chemical signals caused by biological processes

Martha McClintock (1971) studied 135 female college students sharing dormitories. She found that roommates and closest friends showed significant similarity in their date of menstrual onset. She speculated that this menstrual synchrony could be due to **pheromones**. Further investigations by Kathleen Stern and Martha McClintock (1998) studied the effect of pheromones on the menstrual cycle directly. Nine female donors wore pads daily under their armpits for eight hours a day throughout their menstrual cycle to gather their pheromones. The pads were treated and the pheromones gathered were rubbed onto the upper lip of 20 other females. They found that 68 per cent of the female participants had changes to their menstrual cycle which aligned them closer to the donor's cycle.

However, Anna Ziolkiewicz (2006) reports that 30 years of ongoing investigations into menstrual synchrony have not produced convincing evidence; in fact there is an ever-growing body of studies which have not found such synchrony among females. She studied students in Polish dormitories in Krakow, and in 18 pairs and 21 triplets of females she found no evidence in alignment of menstrual cycles. She also argues that there would be no evolutionary benefit to menstrual synchrony as it would only increase mate competition between females.

### SEASONAL AFFECTIVE DISORDER

Seasonal affective disorder (SAD) is a mood disorder where an individual suffers episodes of major depression during the autumn and winter months. Individuals experiencing SAD have low mood and feelings of hopelessness, tiredness and oversleeping, lack of motivation and interest in activities, and changes in appetite, all of which can impact upon daily activities and quality of life. SAD is thought to be caused by reduced exposure to daily light because of the shorter day length, which causes a disruption to the circadian sleep–wake cycle.

SAD is a complex disorder which can be explained by multiple factors. One factor is that the reduction in natural daily light during winter has an impact on melatonin production.



Fluctuations in melatonin in response to darkness may account for individuals feeling tired and oversleeping. Changes in light can also impact on the regulation of neurotransmitters such as serotonin, known to reduce in low light. Serotonin is known to regulate mood and promote feelings of well-being. Low light will reduce serotonin activity and result in low mood.

### Research into seasonal affective disorder

Erin Michalak and Raymond Lam (2002) reviewed 22 studies to look at the relationship between latitude and the prevalence of SAD and found a correlation of 0.66, which is consistent with the shorter days experienced in the north compared to the south being associated with the mood disorder. However, care should be taken when interpreting this finding because individuals less affected by SAD are likely to remain in the north while those sensitive to SAD are, over time, more likely to migrate south. This potential confounding variable would weaken correlation data. Andrés Magnusson and Jóhann Axelsson (1993) investigated the prevalence of SAD in Icelanders who had migrated south to Manitoba, Canada compared to those living at the same latitude and found lower rates of SAD among the migrated Icelanders. This suggests that Icelanders may be less sensitive to SAD generally, which would support the confounding variable weakening correlation research.

#### LINK

Correlations as a research method and how to interpret correlation data is discussed further on page 185.

SAD can cause a variety of symptoms. Dongdong Qin et al. (2015) reduced daylight in a group of eight macaque primates and found an increase in depressive symptoms, such as huddling, reduced movement and weight loss, which could be reversed with antidepressant treatment.

#### LINK

Antidepressants are discussed later in this chapter on page 183.

SAD is an extreme form of winter depression, but winter depression has been reported in the general population. Scott Golder and Michael Macy (2011) analysed 509 million Twitter (now X) messages from 84 countries across the globe and found a relationship between decreased day length and less positive emotions. Furthermore, Fabon Dzogang et al. (2017) analysed 800 million social media messages and the purchase of health-related products (e.g. tiredness remedies), and found that social media messages tended to be more sad in the winter and the purchase of fatigue remedies was also higher during the winter months.

Yunsheng Ma et al. (2006) conducted a longitudinal study measuring the caloric intake of 593 participants in Massachusetts, USA, and found that the average calorie consumption was 86 kcal per day higher in the autumn compared to the spring. Furthermore Samuel Serisier et al. (2014) conducted a four-year study on food intake in a colony of cats and found that cats ate on average 15 per cent more in the winter months (October to February) than the summer months (June to August).

Konstantin Danilenko et al. (1994) found high levels of melatonin during the daytime of winter months in SAD patients compared to healthy controls, and furthermore found that this difference disappeared after light treatment and in the following summer months. However, other research has failed to show any differences in melatonin levels between SAD patients and control groups across the different seasons of the year.

The largest body of research into SAD has focused on the role of the neurotransmitter serotonin. Serotonin has a clear cycle showing reduced levels in the winter months, one



## KEY TERMS

**agonist:** chemical substance (drug) that binds to and activates a receptor to cause a signal. When an agonist binds to a receptor it triggers a biological response which mimics a neurotransmitter

**double-blind:** a study where neither the participants or the researchers collecting data are aware of who is receiving a treatment

**placebo:** an inactive substance which has no impact upon biological processes, but may be perceived by the taker as having an effect

theory being that people with SAD have an increase in the reuptake of serotonin, leaving less in the synaptic gap causing depressive symptoms. Medications that stimulate serotonin activity have demonstrated an improvement in subjective joy. Robert Levitan et al. (1998) used a **double-blind**, randomised, **placebo** trial to test the effectiveness of serotonin **agonist** drugs on 14 female patients with SAD and found that those taking medication reported less sadness. This and many other studies have found that drugs targeted to activate serotonin have subjective euphoric effects.

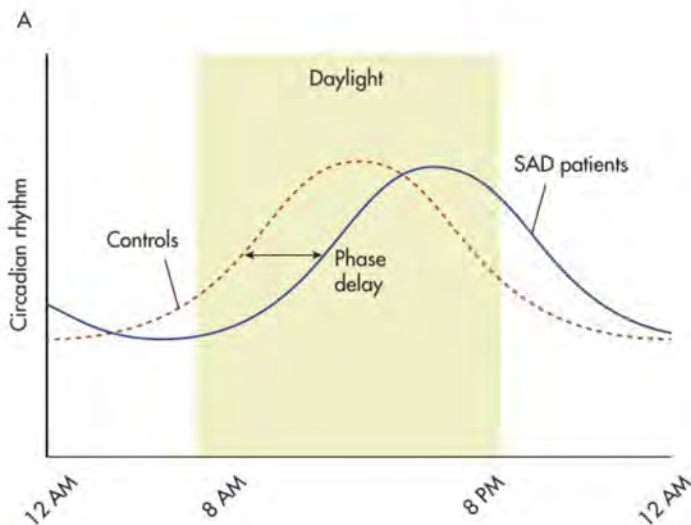
One significant strength of research into SAD is that establishing causes of the disorder have been used to inform treatments for the symptoms. Drug treatments, for example antidepressants such as SSRIs (selective serotonin reuptake inhibitors), are a common medication for patients with SAD and light therapy is also useful.

## LINK

Light therapy will be discussed in detail on page 182.

## THERAPIES FOR SEASONAL AFFECTIVE DISORDER

The National Institute for Health and Care Excellence (NICE) recommends that SAD should be managed and treated in the same way as other mood disorders. NICE recommends using talking therapies, such as cognitive behavioural therapy, or medication such as antidepressants. However, a popular therapy for SAD is light therapy.



▲ Figure 16.3 Light therapy adjusts the circadian phase delay by exposing SAD patients to light in the morning

## Light therapy

Light therapy is a phototherapy involving the exposure of an individual with seasonal affective disorder to a bright light source, often referred to as a light box. Light therapy is a treatment which is used during the winter months when there is reduced natural daylight as the days are shorter. The purpose of light therapy is to reduce the symptoms of SAD, such as low mood and disruption to sleep patterns, which are known to be sensitive to natural sunlight. Light therapy is thought to reduce the production of melatonin and increase the availability of serotonin. Although the actual way in which light therapy works is unknown, it is believed to correct the winter circadian phase delay.

Light therapy involves daily exposure to bright light of around 10 000 lux for between 20–60 minutes daily during the autumn and winter, using a light box or light lamp. Alfred

Lewy et al. (2007) suggest that SAD occurs because the circadian rhythm is typically phase delayed, so light therapy is typically done in the morning, just after waking, to help reset the internal body clock and help regulate the sleep–wake cycle (see Figure 16.3).

## Evaluation of light therapy as a treatment for SAD

While light therapy is considered a non-invasive therapy it can cause side effects such as headaches, nausea and eyestrain, and is not recommended for individuals with certain medical conditions, or if taking photosensitive medication (some antibiotics), or those with eye problems such as glaucoma or cataracts. It also involves considerable commitment to a therapy regimen, which can involve sitting in front of a light box for several hours each morning, which itself can interfere with daily routines.

One of the first trials of bright light therapy was conducted by Norman Rosenthal et al. (1984) who exposed SAD patients to bright light in the morning and evening for two weeks,



finding a significant reduction in depression ratings recorded. The same patients were then exposed to dim light, and they were found to have an increase in depression ratings. This demonstrates that the effectiveness of light therapy is dependent on the luminosity of the light used.

Furthermore, there is potential for light therapy to be used on other mood disorders such as unipolar and bipolar depression. Robert Golden et al. (2005) conducted a meta-analysis on randomised controlled trials to assess the evidence for using light therapy to treat mood disorders. They found that bright light treatment caused a significant reduction in the severity of depressive symptoms for mood disorders, and dawn light exposure was effective in the treatment of SAD at a rate equivalent to most antidepressant medication trials. This suggests that light therapy could be a safer alternative to medication for many people.

With much medical research, it is difficult to establish whether an improvement in mood and reduction in symptoms are a result of the therapy or because of a **placebo effect**, particularly because receiving light therapy treatment or not is quite obvious to participants. To test this, Charmaine Eastman et al. (1998) studied 96 patients with typical SAD symptoms, randomly allocating them to one of three treatment groups. One group were exposed to morning bright white light for 1.5 hours for four weeks, a second group were exposed to evening white light, and a third group to a morning placebo of sham negative-ion generators emanating red and green light. Participants gave weekly depression ratings and, after three weeks, participants exposed to morning bright light had greater symptom reduction than the placebo group. However, there are ethical issues with conducting placebo trials as inevitably one group of patients have the therapy withheld, particularly if the patients' symptoms are severe and the effectiveness of the treatment is proven.

While it seems that light therapy is effective, there is a need for long-term research to be conducted to investigate whether it just treats symptoms in the short term or whether it can be effective in reducing the recurrence of SAD in the future. There is also a great degree of individual variation in severity of symptoms and response to light therapy, as well as differences in circadian rhythms which affect treatment outcomes. We also do not yet fully understand the biological mechanisms affected by light therapy and how it alters neurotransmitters or influences the circadian rhythm.

### Antidepressants

Antidepressants are used as a treatment for mood disorders, such as depression, and are commonly prescribed for SAD. An antidepressant type of medication known as selective serotonin reuptake inhibitors (SSRIs) are commonly prescribed for SAD because they block the reuptake of serotonin by binding to the transporters leaving more serotonin available in the synaptic gap, resulting in elevation of mood.

### Evaluation of antidepressants as a treatment for SAD

Raymond Lam et al. (1995) compared the effectiveness of fluoxetine, an SSRI, with a placebo group in the treatment of SAD in 68 patients diagnosed with winter depression. Both the fluoxetine and placebo groups showed improvement in depressive symptoms, with the fluoxetine group recording lower depression scores after five weeks of treatment; 59 per cent of the fluoxetine group showed a 50 per cent or greater reduction in depressive symptoms compared to 39 per cent of the placebo group. In a larger group of 187 SAD patients, Adam Moscovitch et al. (2004) found that sertraline given in a flexible dose (50 to 200 mg per day) for eight weeks reduced depression scores compared to a placebo group. In both studies patient drop-out was very low, also indicating that the treatment was perceived to be successful in reducing the symptoms of SAD.

In a study to compare the effectiveness of light therapy and antidepressant medication, Raymond Lam et al. (2006) randomly assigned SAD patients to a fluoxetine plus placebo light

#### KEY TERM

**placebo effect:**  
improvement is shown  
because of an expectation  
of improvement



▲ Light therapy is one possible treatment for SAD



(dim) condition or light treatment plus placebo pill condition. Over eight weeks depression scores were taken and no difference was found in the effectiveness of light therapy and fluoxetine (fixed at 50 mg per day). Both were equally effective in symptom reduction, although light therapy was quicker to take effect. This suggests that both treatments are effective in the treatment of SAD, so deciding which treatment to use may depend upon clinical judgement and preference. Antidepressant medication can cause adverse side effects, such as headaches and nausea, and in rare cases serotonin syndrome, and they often take weeks to have an effect. On the other hand, light therapy requires a time commitment to a regimen of light exposure which can be a daily burden.

### CHECKPOINT

- Which of the statements are true and which are false?
  - The pineal gland secretes melatonin in response to light.
  - Melatonin promotes drowsiness.
  - The SCN is an exogenous zeitgeber for the circadian rhythm.
  - The hypothalamic-pituitary-gonadal (HPG) axis is an internal pacemaker for the infradian rhythm.
  - SAD is known as summer depression.
  - Light therapy is conducted just before bedtime to help reset the sleep–wake cycle.
  - SSRI is an antidepressant which blocks the reuptake of serotonin.
- Jet lag is experienced when we travel to a destination in a different time zone to our own. Which journey would be more likely to cause jetlag?
  - Travelling west to east – phase delay
  - Travelling east to west – phase advance

### SKILLS

#### ANALYSIS, PROBLEM SOLVING

### EXAM PRACTICE

- Describe research into the circadian sleep–wake cycle. (2 marks)
- Explain one weakness of research into the circadian rhythm. (2 marks)
- Felix has been working late shifts from 2 p.m. to 10 p.m. for two years, and has been asked to work a normal day shift from 9 a.m. to 5 p.m. but is struggling to adjust to the new routine. Felix feels tired during the day and is struggling to get to bed early at night. His eating habits have been affected as he still wants to eat a big meal late at night.
  - Describe how external zeitgebers could help Felix regulate his sleep–wake cycle. (4 marks)
  - Explain one strength of Felix using external zeitgebers to regulate his sleep–wake cycle. (2 marks)
- Olivia volunteered for a sleep study into the circadian rhythm. Her normal circadian rhythm was 24 hours. She was isolated for two weeks in a laboratory with no natural light. She was able to turn lights in the room on and off when she was sleeping and awake, and was able to ask for food when she felt hungry. By the end of two weeks Olivia awoke at 6 a.m., fell asleep at 11 p.m. and then awoke again at 10 a.m., she had a sleep–wake cycle of 28 hours. Explain, using research, why Olivia's circadian sleep–wake cycle changed. (3 marks)



# CHAPTER 17 METHODS

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- describe and evaluate the use of the correlational research method in psychology, including co-variables
- describe types of correlation and the use of scatter diagrams
- understand the issue surrounding the use of correlations in psychology
- calculate the Spearman's rank test
- describe and evaluate brain-scanning techniques (CAT, PET, fMRI) to investigate human behaviour, including aggression
- describe and evaluate the use of twin studies to investigate genetic relatedness and aggression.

## GETTING STARTED

Correlational research involves looking for relationships between variables. Here are some examples of variables that have been found to have a relationship:

1. Colder weather makes us spend more money in shops.
2. As more mozzarella cheese is consumed, more civil engineering doctorates are awarded.
3. The increase in death caused by falling downstairs is consistent with the rise in smartphone sales.

Consider these questions:

1. Does temperature affect spending? Do we take refuge in shops during the colder months leading us to buy more? Do shops stock more attractive products in cold weather?
2. Does eating mozzarella make us better civil engineers? Do civil engineers need mozzarella to be able to pass a doctorate?
3. Are more of us staring at our smartphones and ignoring our surroundings, causing us to fall down stairs? Are people who get hurt falling down stairs resorting to buying smartphones?

Considering these questions probably made you think about other factors which could explain these relationships, and even question whether such relationships can exist. In this chapter we will examine the nature of relationships as well as issues surrounding relationships which have been found.



▲ Does cold weather mean that people spend more money in shops?

## CORRELATIONAL RESEARCH

Correlational research involves measuring two different variables (co-variables) in order to see if they are related in any way. Correlation studies do not tell you whether one variable caused another to change, but they are a way of looking to see if a relationship might exist between any two co-variables. Co-variables can be measured directly by the researcher, or they could be obtained from secondary data gathered from other sources. In biological psychology, co-variables might include measuring the number of genes a person shares (closeness of family relationship) and a behavioural characteristic such as the amount of aggression they show. By plotting scores on these two variables on a graph called a scatter diagram it is possible to see if any relationship exists between them.



## SKILLS

CRITICAL THINKING,  
INTERPRETATION

## ACTIVITY 1

It's important to understand the difference between experimental and correlation research.

Experimental research involves establishing a causal relationship between an independent variable and a dependent variable by looking at differences between groups. Correlation research compares co-variables to see what relationship they have to each other.

Which of the following examples are investigating differences between groups (experimental research) and which are investigating relationships between variables (correlation research)?

1. Cats will sleep longer than dogs.
2. Students who attend revision classes will score higher on a test than students who do not attend.
3. The more aggressive you are the unhappier you are.
4. Increased stress at work is associated with more snacks being eaten.

## LINK

You learned about independent and dependent variables on page 103.

## MATHS TIP

Because a correlation is not an experiment, the hypothesis is known as an 'alternate hypothesis' and not as an experimental hypothesis. A directional alternate hypothesis for a correlation will either predict a positive (both variables increase together) or negative (as one variable increases the other decreases) relationship. A non-directional alternate hypothesis for a correlation will simply predict that a relationship will occur. The null hypothesis will predict no relationship. Compare this to the way in which an experimental hypothesis is written, specifically that it predicts a difference or a specific direction of difference.

## LINK

You learned about hypothesis construction on page 102.

## SKILLS

PROBLEM SOLVING,  
INTERPRETATION

## ACTIVITY 2

Decide whether these correlation hypotheses are directional (one-tailed) or non-directional (two-tailed) alternative hypotheses or a null hypothesis.

1. There will be no relationship between temperature and ice cream sales.
2. There will be a positive correlation between spending and happiness.
3. There will be a negative correlation between spending and bank balance.
4. There will be a relationship between hours spent shopping and number of items purchased.
5. There will be no relationship between amount of food eaten and time spent sleeping.
6. As temperature increases, the number of swimming pool-related accidents increases.
7. The more items purchased in a shopping trip, the less money is in the bank account.



## EVALUATION OF CORRELATION AS A RESEARCH METHOD

There are many issues associated with the use of correlational research in biological psychology. One key problem is that you can only see a relationship between two variables and it is impossible to tell which is the causal variable (i.e. which one made the other change). In fact, it is possible that any relationship that seems to exist may merely be coincidental. For example, in a correlation of stress and aggression, it could easily be shown that the more stress people experience, the more aggression they show, which would suggest a positive correlation. But we would not be able to tell if being stressed made you aggressive, or vice versa.

We would also be unable to tell if there was another factor (i.e. a third variable) that could have caused both an increase in stress and aggression. For example, the weather might have been very warm, which could have increased both stress levels and aggression separately from one another.

Some biological psychologists use correlations to test for genetic explanations for behaviour by measuring the amount of genetic similarity between two people and the amount of similarity in their behaviour (concordance rate) and plotting these to look for a relationship. However, there are many reasons why people who are closely related share the same behaviours that have nothing to do with their shared genes. For example if they live together, or share many of the same experiences, then we cannot ignore how this could influence them to show the same behaviours.

Correlations can use secondary data (information gathered from the research of others) to investigate whether there seems to be any link or relationship between two variables to see whether further, more expensive research, may yield useful results. Researchers may believe that two variables are linked, but to start by conducting a large-scale experiment could prove costly if it quickly emerges that their initial idea was wrong. Starting with a correlation to see if a relationship seems to exist, and, if it does, then designing an experiment to see if the relationship is causal, may be much more cost-effective.

Correlational research is also useful before designing experimental research which may have ethical considerations. For example, if you are investigating whether temperature causes aggression, it might be useful to conduct a correlation on arrest rates for aggression in countries which have different annual temperatures, before subjecting participants to varying heat to see if they become more aggressive.

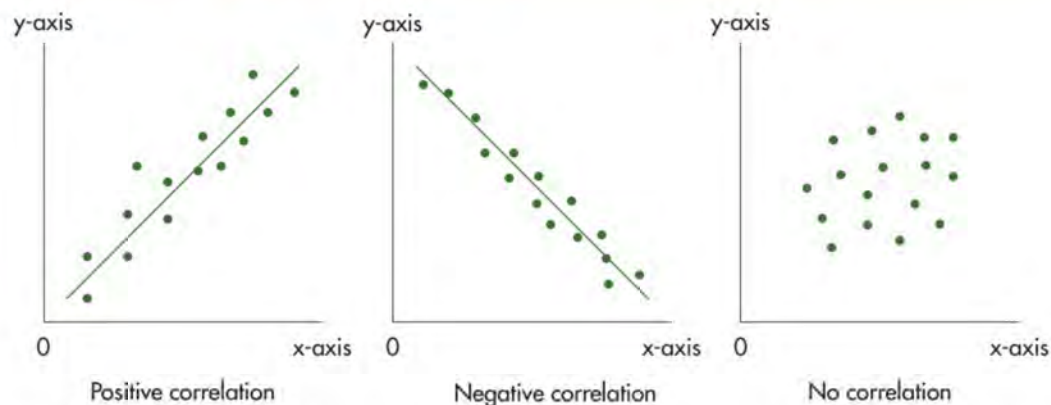
## ANALYSING CORRELATIONAL DATA

Once you have gathered data you can analyse it to look for a relationship between the co-variables. This can be done using a scatter diagram and an inferential test of significance.

### Scatter diagram

The most obvious way to see the relationship between any co-variables is to plot them on a scatter diagram (also called a scattergraph, see Figure 17.1). One variable is plotted on the y-axis, and the other along the x-axis, and then the trend can be seen in the positioning of the dots on the graph where the corresponding points meet. For example, if a person scored 50 on a test of stress, and they also did a test of their aggression level and scored 125 on that, on the point at which those two points intersected on the scatter diagram you would place an x. You would then do the same for every other participant's scores on the stress test and aggression test, which would allow you to see if there was any link between the variables, once all the scores had been plotted.





► Figure 17.1 Positive, negative and no correlation

If it seems as if the variables do show some kind of link, you can then go on to investigate this further by conducting an inferential test of significance. This is known as a Spearman's rank test which looks for a relationship between co-variables. Here we are going to look at how to conduct a Spearman's rank test on data gathered, and what this can tell us.

Consider for a moment that we have gathered some correlational data, for example in an investigation into the link between the number of hours of revision that students did for a test, and the mark they achieved on a test of the topic they were told to revise (Table 17.1).

TABLE 17.1: DATA ON STUDENTS' MARKS AND HOURS OF REVISION

Student number	Hours of revision	Mark/20 achieved on the test
1	4	14
2	2	11
3	1	8
4	3	7
5	4	17
6	5	20
7	1	7
8	1	12
9	6	18
10	4	15

#### MATHS TIP

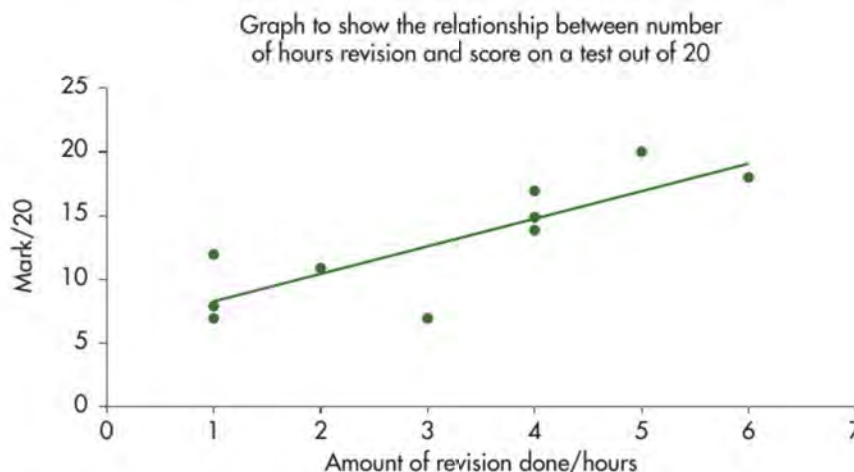
In order for a scatter diagram to be used to plot data correlation, the levels of measurement must be at least ordinal. This will allow you to see whether the two measured co-variables are related.

#### LINK

Levels of measurement have been covered on page 115.



Figure 17.2 shows a scatter diagram to illustrate this data and you can see from the trend line added that there appears to be a positive correlation between the two variables. However, the line does not suggest that the correlation is strong so to be sure that we can actually conclude that the number of hours of revision is related to the score achieved on a test, further investigation would be needed and this is where an inferential test would be useful. For this data, because we are conducting a correlation and the data gathered is best treated as ordinal, a Spearman's rank test would be most appropriate.



▲ Figure 17.2 Scatter diagram to show a relationship

### Spearman's rank test

Spearman's rank is an inferential test that is used to see whether statistical data gathered in a correlation using ordinal data can be generalised from the sample used to the whole population. It can only be used to analyse correlational data, and only works where the level of data is ordinal, or can be reduced to ordinal (if it was originally gathered as interval or ratio data for example).

The formula to conduct a Spearman's rank calculation is:

$$r_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

where  $r_s$  represents the result of the test,  $d$  represents the difference between the ranked position of the scores on each row, and  $n$  represents the number of scored pairs gathered (in this case  $n = 10$ ). The symbol  $\sum$  means 'the sum of' or 'the total'. To illustrate how to do this calculation, work through the following example.

The first thing to do when calculating a Spearman's rank test is to rank the scores of each of the two variables measured – in this case, the hours of revision and the mark achieved.

#### LINK

The use of alternate, experimental and null hypotheses and the use of IV and DV in experiments can be found in Chapter 12.

#### LINK

How to rank data can be found on page 117.



For any ranks where there are a number of scores that are the same/tied, work out the mid-point of the ranks they would take up. For example, in the number of hours of revision, there are three people who did four hours revision who would take up positions 3, 4 and 5 in the ranks, so they each get a rank of 4 and then the next rank available will be position 6 for the person who did three hours of revision (Table 17.2).

TABLE 17.2: DATA ON STUDENTS' MARKS AND HOURS OF REVISION WITH RANKING

Student number	Hours of revision	Rank of revision hours	Mark/20	Rank of mark	Difference in ranks ( $d$ )	$d^2$
1	4	4	14	5		
2	2	7	11	7		
3	1	9	8	8		
4	3	6	7	9.5		
5	4	4	17	3		
6	5	2	20	1		
7	1	9	7	9.5		
8	1	9	12	6		
9	6	1	18	2		
10	4	4	15	4		

The next step is to work out the difference between the ranked positions of each pair of scores. The easiest way to do this is to subtract the second rank from the first rank and then record this in the next column (Table 17.3).

TABLE 17.3: DATA ON STUDENTS' MARKS AND HOURS OF REVISION WITH RANKING DIFFERENCES

Student number	Hours of revision	Rank of revision hours	Mark/20	Rank of mark	Difference in ranks ( $d$ )	$d^2$
1	4	4	14	5	-1	
2	2	7	11	7	0	
3	1	9	8	8	2	
4	3	6	7	9.5	-3.5	
5	4	4	17	3	1	
6	5	2	20	1	1	
7	1	9	7	9.5	-0.5	
8	1	9	12	6	3	
9	6	1	18	2	-1	
10	4	4	15	4	0	



The final thing to do with this data set is to square the differences in order to get rid of any negative figures and calculate the total of squared difference (Table 17.4).

TABLE 17.4: DATA ON STUDENTS' MARKS AND HOURS OF REVISION WITH RANKING DIFFERENCES SQUARED

Student number	Hours of revision	Rank of revision hours	Mark/20	Rank of mark	Difference in ranks ( <i>d</i> )	<i>d</i> <sup>2</sup>
1	4	4		5	-1	1
2	2	7	11	7	0	0
3	1	9	8	8	1	1
4	3	6	7	9.5	-3.5	12.25
5	4	4	17	3	1	1
6	5	2	20	1	1	1
7	1	9	7	9.5	-0.5	0.25
8	1	9	12	6	3	9
9	6	1	18	2	-1	1
10	4	4	15	4	0	0
Total						<i>d</i> <sup>2</sup> = 26.5

This is now all of the information required to put into the formula and calculate Spearman's rank:

$$r_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

$$r_s = 1 - \frac{6 \times 26.5}{10(10^2 - 1)} \quad r_s = 1 - \frac{159}{10 \times 99} \quad r_s = 1 - \frac{159}{990} \quad r_s = 1 - 0.161 \quad r_s = 0.839$$

#### KEY TERM

**correlation coefficient:** a number between 0 and 1 which shows how much a change in one variable is related to a change in another variable

Once the value of  $r_s$  has been calculated, we can then consider the calculated **correlation coefficient** ( $r_s$ ) to see how closely, if at all, the co-variables are related. A coefficient is a figure between +1 and -1 that can tell you how strong any existing relationship is between the two variables. In this case, the calculated coefficient is  $r_s = 0.839$ , which suggests that there is a strong, positive correlation between the number of hours revision done by the students, and the mark they achieved for the test on that topic.

#### MATHS TIP

The correlation coefficient is a number between +1 and -1 that represents how the change in one variable is related to the change in another variable. A positive coefficient refers to a positive correlation, while a negative figure relates to a negative correlation. The closer to +1 or -1 the coefficient is, the stronger the correlation. The closer to 0 the figure is, the weaker the correlation. A coefficient of 0 indicates no correlation at all.



## KEY TERMS

**critical/table value:** a statistical cut-off point. It is a number presented on a table of critical values that determines whether the result is significant enough for the null hypothesis not to be accepted

**observed/calculated value:** the value given by a statistical test, such as for the Spearman's rank test. It is compared with the relevant critical/table value to see if a null hypothesis should be retained or not

**statistical significance:** the probability that the data is a result of an actual relationship/difference existing between the variables rather than chance factors

The next step is to look at whether this result is statistically significant, that is, whether the result is truly showing a relationship between the two variables. If a result is found to be significant it may be that the two variables are related in some way, but if the result is shown not to be significant then there is a high chance that any relationship seen is actually the product of something else such as sampling error.

In order to tell whether the results are significant it is important to understand the term **statistical significance**. When conducting research and analysing the data using descriptive statistics, such as measures of central tendency or dispersion, it is possible to observe trends in the data but it is unclear whether these trends are showing how one variable is actually affecting another in some way. Inferential statistical tests allow researchers to work out the probability that their data is the result of an actual relationship existing between the variables rather than a coincidence.

## LINK

Measures of central tendency and dispersion are covered on pages 46–49.

Psychology generally accepts a level of significance of 5 per cent, which is often expressed as  $p \leq 0.05$ , where  $p$  stands for 'the probability of the results being due to chance' – the probability of the results being due to chance is less than or equal to 0.05 or 5 per cent. Once the result of a statistical test has been calculated, this figure is known as the **observed/calculated value**.

This observed/calculated value then has to be compared to a table of **critical/table values** to assess whether it is significant – these figures have been calculated by statisticians to enable us to more easily tell whether our data meets the criteria to be significant. Table 17.5 shows part of a critical/table values table for the Spearman's rank test and, in order for the result to be significant, the observed/calculated value needs to exceed the critical/table value in the table relevant to the study conducted.

TABLE 17.5: CRITICAL VALUES FOR SPEARMAN'S RANK TEST

	Level of significance for a one-tailed test			
	0.05	0.25	0.01	0.005
	Level of significance for a two-tailed test			
$n$	0.1	0.05	0.025	0.01
4	1.000	1.000	1.000	1.000
5	0.900	1.000	1.000	1.000
6	0.829	0.886	0.943	1.000
7	0.714	0.786	0.893	0.929
8	0.643	0.738	0.833	0.881
9	0.6000	0.700	0.783	0.833
10	0.564	0.648	0.745	0.794

The calculated  $r_s$  must be equal to or exceed the table (critical) value for the significance at the level shown.



## SKILLS

PROBLEM-SOLVING, DECISION-MAKING, ANALYSIS

## ACTIVITY 3

When using critical values tables it is important to compare the calculated value to the critical value when determining significance. If you compare the critical value to the calculated value you will draw the wrong conclusion. Practise comparing these calculated values to the table of critical values above to determine whether the result is significant.

1.  $r_s = 0.600$  for a one-tailed test at  $p \leq 0.05$  when  $n = 10$
2.  $r_s = 0.800$  for a one-tailed test at  $p \leq 0.05$  when  $n = 6$
3.  $r_s = 0.700$  for a two-tailed test at  $p \leq 0.05$  when  $n = 9$
4.  $r_s = 0.900$  for a one-tailed test at  $p \leq 0.01$  when  $n = 8$

For the data above, the  $n$  value was 10 so the final row of the table would be used. If the original hypothesis was directional (one-tailed) then the critical value of interest would be the first column (0.564), whereas if the hypothesis was non-directional (two-tailed) then the critical value of most interest would be in the second column (0.648) as these relate to the 0.05 level of significance. The observed value of  $r_s$  in the above example was 0.839 and, as this exceeds the critical values, regardless of whether the hypothesis was directional or non-directional, the result would be significant, meaning that the alternative hypothesis could be accepted and the null rejected. This means that there was an equal to or less than 5 per cent probability that the relationship that was found occurred by chance. In fact the calculated Spearman's rank value of 0.839 exceeds the critical values for a one- and two-tailed test at  $p \leq 0.01$ , so we can be even more confident in the relationship found. This also means that there is less chance of a type 1 error having been made (less than 1 per cent likely).

Caution should be exercised when interpreting the results of a Spearman's rank test when a large sample size has been used because the greater the sample, the more likely you are to find that the results are significant, even if the correlation coefficient is close to zero. You should also check for outliers or extreme scores in the data. These may affect the correlation coefficient you calculate, and therefore whether the findings are significant or not.

## LINK

You learned about type I and type II errors on page 114.

## LINK

Levels of measurement (ordinal, interval, nominal) can be found on page 115.

## MATHS TIP

A table of critical values for a Spearman's rank shows only positive values. When you compare the correlation coefficient from your test to the critical values in the table, you should ignore whether your coefficient is positive or negative to determine its significance. For example, if your coefficient is  $-0.5$ , you should ignore the negative ( $-$ ) sign when you compare it to the critical value in the table to determine significance, but remember that it is negative when you interpret your findings and relate it back to the hypothesis. The positive or negative sign indicates the direction of correlation, and the co-efficient indicates the strength of the relationship.

## SKILLS

DECISION-MAKING, ANALYSIS, INTERPRETATION

## ACTIVITY 4

Conduct your own correlation and analyse the data. Gather data from your classmates on the number of hours they sleep on average per night and the average amount of time spent on social media or watching television. You should gather both scores from each participant.

Then plot your scores on a scatter diagram to look for trends.

Analyse the data further by calculating the Spearman's rank test of significance.

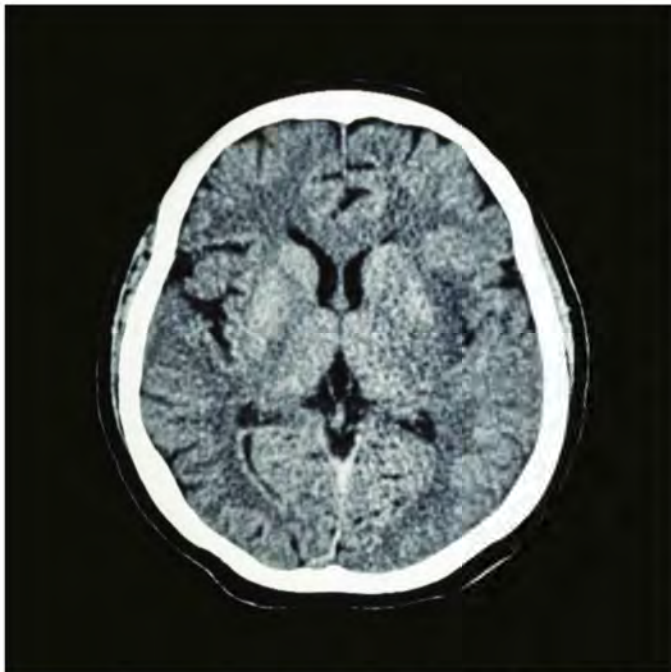


## BRAIN-SCANNING TECHNIQUES

Brain-scanning techniques are used to provide a visual of the structure and function of the brain. Researchers can examine the images produced by the scanning techniques to investigate which parts of the brain are involved in certain behaviours, such as aggression.



A scan can last from a few seconds up to ten minutes, depending on the body area being investigated



▲ A computer processes the information from the CAT scan and the results are then passed to a radiologist to interpret

### COMPUTERISED AXIAL TOMOGRAPHY (CAT) SCAN

CAT scans are sometimes referred to as CT scans (computed tomography) and can be used to take images of any part of the body including the brain. CAT scans of the brain involve passing X-rays into the head, but unlike a standard X-ray where the beam is focused on one specific area, multiple beams are passed around the head from different angles to gather more information. A standard X-ray may be used to investigate whether a bone is broken so a single beam focused on one area would be useful for this purpose.

When scanning something as complex as the brain, more information is needed. The information from the multiple X-ray beams is interpreted by a computer and a detailed still image of the structure of the brain can be seen. This is useful for detecting areas of brain damage following an accident or the positioning of tumours in the brain but it does not give any information about how the brain is functioning. CAT scans can be useful when investigating aggression because they can identify structural abnormalities in parts of the brain associated with aggressive behaviour, such as damage to the prefrontal cortex.

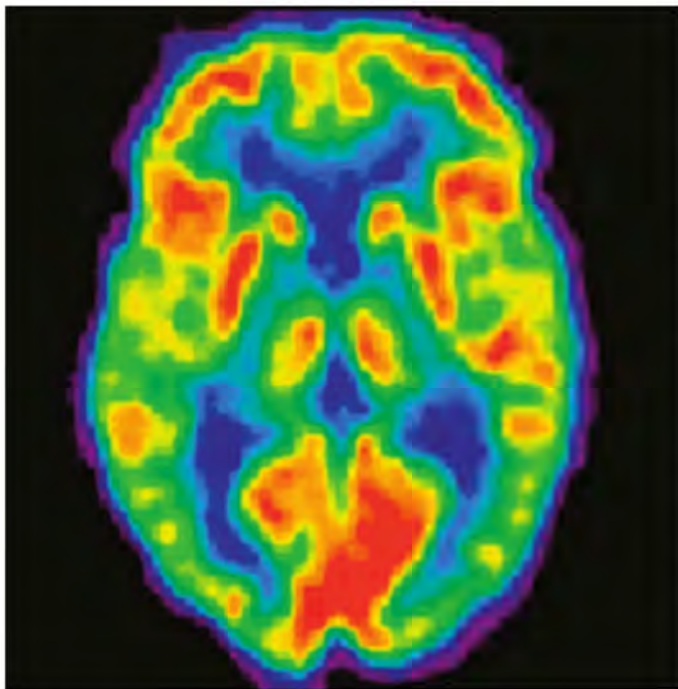


**KEY TERM**

**gamma rays:** gamma rays are created when a positron meets an electron. A positron is injected into the body (FGD) and when it encounters an electron they converge in a process known as annihilation. This converts the mass of both the positron and electron into gamma rays. These gamma rays are detected by the scanner

The use of X-rays in CAT scans can pose a risk to patients as they involve exposure to radiation and it is advised that they are only used where the possible benefits in relation to diagnosis outweigh the potential risks. If the scan removes the need for exploratory surgery then this would be preferable, especially as unnecessary brain surgery is much more risky for the patient. Pregnant women are advised not to have CAT scans wherever possible as there is some evidence that exposure to X-rays can damage the unborn baby.

The advantages of using CAT scans include the fact that they are very quick to conduct and can give accurate details of brain structure, which can help to guide clinicians in decision-making regarding treatment or surgery. A CAT scan may help a surgeon to better plan a procedure before surgery takes place by being able to accurately see the layout of the brain structures before physically entering the skull. This may make the procedure faster and more efficient, reducing the risks associated with longer duration under anaesthetic for patients.



▲ A PET scan

**POSITRON EMISSION TOMOGRAPHY (PET) SCAN**

PET scans are a form of nuclear medicine procedure as they involve injecting the patient with a small amount of radioactive material in order to conduct the scan. Patients having a PET scan of the brain will be injected with a substance known as 'fluorodeoxyglucose' (FDG). This is a tracer substance where the radioactive atom is attached to glucose, because the brain will use up the glucose as a form of energy. Once the tracer has been absorbed into the bloodstream, a task may be given to stimulate the brain (such as the task used in the Raine et al. study (1997)) and encourage metabolic activity. As the brain is working, the glucose will be used up and, as this happens, the radioactive atoms start to break down emitting positrons. During this process **gamma rays** are produced and it is these that the scanner picks up. High concentrations of gamma rays will be found in areas of high activity as a lot of glucose will have been used up there, while areas of low activity will have fewer gamma rays present. The image produced from these traces can be colour coded with areas of high activity shown by warmer colours like red, and areas of low activity shown by cooler colours such as blue.

PET scans can be useful for investigating areas of the brain that are not functioning normally, which could indicate damage or tumours. PET scans can be useful at identifying abnormal functioning associated with different regions of the brain which may affect aggression. Adrian Raine found abnormal functioning in the brains of 41 violent murderers using a PET scan.

**LINK**

Raine et al.'s (1997) study is discussed further on pages 201–204.

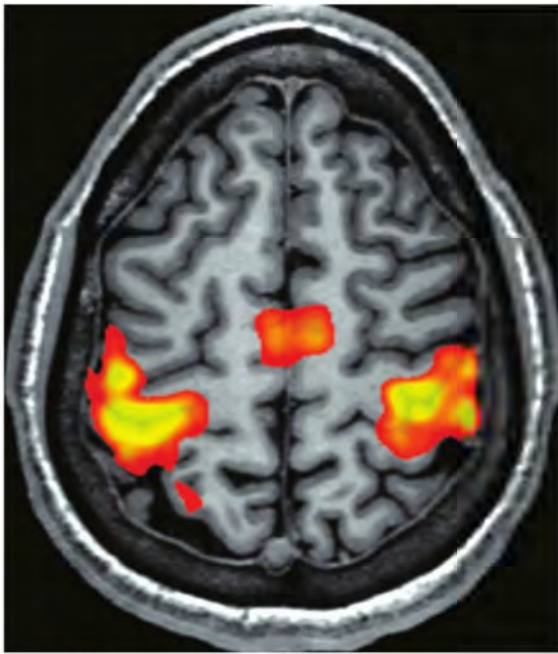
**KEY TERM**

**metabolic activity:** metabolic activity in the brain is a chemical process where glucose is broken down and used as energy for brain function

PET scans detect areas of damage by indicating which parts of the brain are showing abnormal levels of **metabolic activity**, and this can help researchers to not only see where problems exist, but also predict what kinds of issues patients might face in relation to the brain activity being shown. These scans are, however, more invasive than other techniques such as CAT scans as they require the patient to be injected with a radioactive substance. Although this carries a low risk due to the very low levels of the substance involved, it is



not advisable for patients to have too many of this type of scan unless absolutely necessary because it is unclear whether there may be long-term effects. The resolution of PET scans is not as good as other scans, and analysis needs to be conducted by trained experts.



▲ An fMRI scan

### FUNCTIONAL MAGNETIC RESONANCE IMAGING (fMRI) SCAN

Functional MRI (fMRI) scans are a relatively new procedure, designed in the 1990s to enable images of brain activity to be gathered without the use of radiation. The idea behind fMRI scanning is that brain activity is associated with blood flow in the brain and this activity is used to gather the information by the scanner to produce a picture. Because of its comparative safety in relation to other forms of functional scans, such as PET scans (which use radiation), fMRI scans are often the procedure of choice for psychologists researching brain activity.

Having a functional MRI scan involves placing the head inside a very large, very powerful electromagnet. Inside the magnetic field, the nuclei within hydrogen molecules in water align themselves with the direction of the magnetic field. As neural activity increases in the brain, blood flow increases in the active areas to keep up with the demand for oxygen. The oxygen is carried to the neurons in haemoglobin within red blood cells. Haemoglobin, when carrying oxygen, repels a magnetic field (diamagnetic), but when it has been deoxygenated it will follow the direction of the magnetic field (paramagnetic) and it is these changes that the scanner will detect to create an image. The scanner sends the

information to a computer that is then able to create a three-dimensional map of activation to show changing levels of neural activity in different brain areas as tasks are being completed.

Because of the use of high-powered magnetic fields in fMRI scanning, some people are unable to have these kind of brain scans. For example, anyone with a cardiac pacemaker or who has had recent metal surgical implants would not be able to have one of these scans. These scans are, however, non-invasive and do not involve any injections of radioactive substances so they do not have any of the potential risks associated with PET scanning, and have better resolution and accuracy than PET scans.

Anyone who is claustrophobic or unnerved by confined spaces or loud noises may become quite stressed during fMRI scanning procedures as they have to lie flat and still in a large tube for the duration of the scan, which may be difficult for some, such as children. This can upset some people and therefore may not be suitable for all patients.

The fMRI compares the brain at rest to the brain undertaking a cognitive activity to display which parts of the brain are reacting to the task. However, the brain when we are awake is rarely in a resting state because we are processing information all the time, therefore it is difficult to get a baseline measure of brain activity.

### USING BRAIN-SCANNING TECHNIQUES TO INVESTIGATE AGGRESSION

In recent years psychologists have been using brain-scanning methods to make links between brain structures and activity, and a variety of human behaviours. An element of human behaviour of considerable interest has been aggression and researchers have been using different scanning techniques to explain aggressive behaviour. One example of such a study is Raine et al. (1997), featured in this topic. The researchers used PET scans to look at the brain activity of prisoners convicted of murder and then compared this to a matched control group of non-murderers. Using PET scans they were able to map abnormal brain activity in the murderers' group in areas of the brain associated with impulsivity and risk-taking behaviour, which may explain increased aggressive behaviour.



Other research into violent video games has investigated how the brains of gamers process emotions to see if playing these games may change brain activity, making people more likely to become aggressive. Christian Montag et al. (2011) used fMRI scans and found that gamers showed lower levels of activity in reaction to pictures of negative emotion than the control group did. This dampening of the brain's response to negative emotional stimuli may explain why there is a suggested link between playing a lot of these games and becoming more aggressive, as gamers may not find aggressive actions as 'serious' because their brains do not process them in that way.

However, brain scan research is correlational, so we cannot assume that the brain injury causes aggression. Some argue that being involved in violence may change the way the brain functions, meaning the brain functioning could be an effect of aggression and not the cause. Aggression is typically context dependent, occurring in certain situations, so it might not be able to detect aggressive responses in laboratory conditions. The use of tasks designed to stimulate aggression in the brain may also be criticised for lacking validity as they do not emulate the conditions in which we may react to an everyday aggression-provoking situation. Identifying certain brain structures or patterns of brain functioning associated with aggression can also be ethically problematic and could be used to screen for an aggressive brain. While this could be used to protect the public from individuals identified as having aggressive brains, it could also be used to label and stigmatise certain individuals assuming that future aggression can be predicted. A strength of brain scans is that they produce visual images of the brain, so while they may be subject to interpretation they can be checked by others to ensure reliability.

### TWIN STUDIES TO INVESTIGATE GENETIC RELATEDNESS AND AGGRESSION

Twin studies provide psychologists with a unique design to test the influence of nature and/or nurture on human behaviour. Monozygotic (MZ), or identical, twins share 100 per cent of the same genetic material, while dizygotic (DZ), or fraternal, twins share only 50 per cent of the same genes like any two siblings. Twin studies assume that twin pairs share equal environments because they are raised together in the same family at the same time. When investigating twins, psychologists are able to compare behaviour between a group of MZ twins and a group of DZ twins to see which group shares the most similarity between each set of twins. Twin studies, therefore, involve comparing the degree of similarity between MZ pairs and DZ pairs. If a behaviour has a genetic component MZ twins will be more similar (share the same behaviour) than DZ twins. If MZ twins and DZ twins are equally similar for a particular behaviour, it is due to their upbringing.

The extent to which behaviour is the same between twins is known as the concordance (correlation) rate. For example, Gottesman and Shields (1966) studied twins over a 16-year period where one had been diagnosed with schizophrenia and found that in monozygotic twins 42 per cent of their co-twins were also diagnosed with schizophrenia, whereas in dizygotic twins only 9 per cent of the co-twins were diagnosed with the same illness. Because the concordance rate is higher in monozygotic twins than dizygotic twins in the Gottesman and Shields (1966) study they concluded that there may well be a genetic element that could explain why people develop schizophrenia.

If the concordance rate was equally high (or low) in MZ twins and DZ twins for any behaviour then the researchers might assume that there was no significant genetic component at play and in fact experiential factors may explain the behaviour as twins are generally raised together and will have shared a similar upbringing. Brendgen et al. (2005) found that MZ concordance for physical aggression was higher than for same-sex DZ concordance, suggesting the role of genetics. Whereas MZ and DZ concordance for social aggression was similar, suggesting the role of upbringing or shared environment.

#### LINK

Brendgen et al. (2005) will be discussed in detail on pages 204–207.





▲ Monozygotic twins are likely to have a very similar life experience because they look so similar, so this could well explain why their behaviour is more concordant than dizygotic twins'

## EVALUATION OF TWIN STUDIES

There are many possible problems with using twin studies in psychological research. The main aim of these types of studies is to investigate biological causes of behaviour, but it is virtually impossible to separate nature completely from nurture. Most DZ twins will be raised together but that does not mean that they will be raised similarly. MZ twins are identical and of the same sex, whereas DZ twins will look different (as alike as any sibling) and could be of a different sex. Therefore it is problematic to assume that, just because MZ twins show a higher concordance than DZ twins for a behaviour, it must be genetic because it could also be due to DZ twins being treated differently compared to MZ twins. That is, we cannot assume that their environments are equal.

Although MZ twins do share 100 per cent of their genetic material, this ignores epigenetics: the fact that environmental conditions switch some genes on and some off. Twins may share their genetic material, but we cannot establish which of each of their genes has been turned on and off by different environmental experiences, even experiences in the womb which may be different for each twin. Therefore MZ twins may have very different personalities and different abilities, so it may be wrong to assume they are more alike than DZ twins.

Another issue associated with twin studies is that sample sizes can be limited, making generalisability difficult. It is not easy to recruit a large and diverse group of MZ and DZ twins, meaning that psychologists will find generalising from their samples problematic.

## WIDER ISSUES AND DEBATES

### Ethics

Gathering accurate and reliable information about people's life experiences, especially for those who are adopted, is likely to be difficult. People may be reluctant to take part in a study that looks into the biological basis of behaviour as it could be uncomfortable for them.

There are also ethical implications associated with using methods such as this to uncover possible influences on behaviours like aggression, as psychologists could be seen as labelling people because of their genetics.

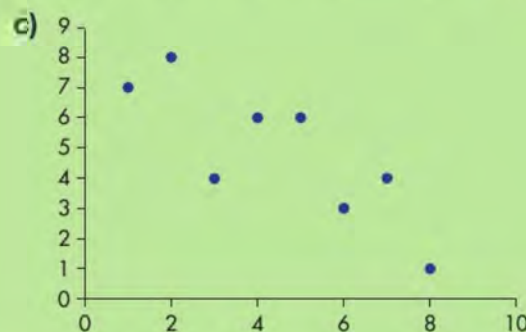
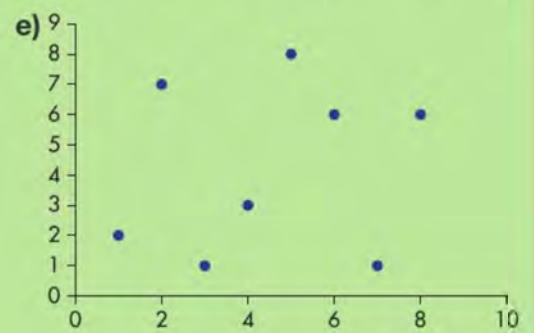
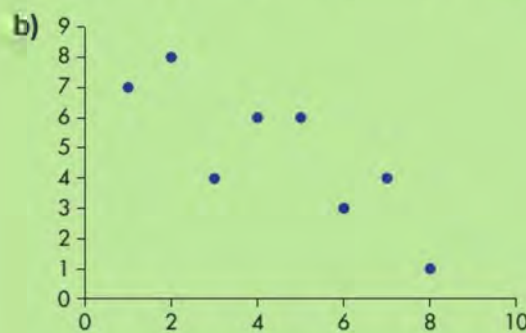
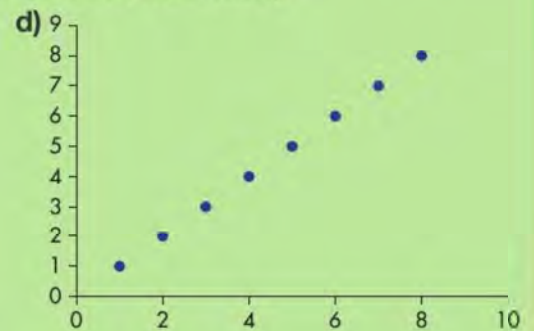
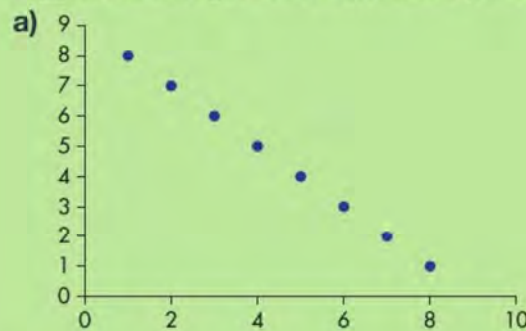


SKILLS

PROBLEM-SOLVING, CRITICAL THINKING, PERSEVERANCE, SELF-DIRECTION

CHECKPOINT

1. Identify the type of correlation (positive or negative) presented in the graphs below, and suggest the strength of the correlation (strong, moderate, weak, none).



2. Identify which statements are true and which are false.
- a) A computerised tomography is a structural scan.
  - b) In a fMRI, oxygenated blood attracts a magnetic field.
  - c) In twin studies, equal concordance for a behaviour between MZ and DZ twins suggests the role of genetics.
  - d) The positron emission tomography scan uses X-rays.
3. Choose the correct answer.
- a) Monozygotic (MZ) twins are:
    - i) identical
    - ii) non-identical
  - b) Dizygotic (DZ) twins share how much of their genetics:
    - i) 100 per cent
    - ii) 50 per cent
  - c) Monozygotic twins are treated:
    - i) more similarly than dizygotic twins
    - ii) less similarly than dizygotic twins
  - d) Dizygotic twins can be:
    - i) either male or female
    - ii) only male or female



4. Identify the direction and strength of these correlation coefficients.

- |          |         |
|----------|---------|
| a) 0.0   | e) -1.0 |
| b) 1.0   | f) 0.4  |
| c) -0.12 | g) -0.9 |
| d) 0.8   |         |

### EXAM TIP

Remember that you can be asked methodology and maths questions from other areas of your course, so it would be worth revisiting the methods sections in other chapters to consolidate your knowledge.

### SKILLS

ANALYSIS, CRITICAL THINKING,  
EVALUATION

### EXAM PRACTICE

- Matilda conducted a correlation to see if there was a relationship between the number of hours slept per night and calorie intake. She asked ten participants to record how many hours they slept per night and the calories they consumed in a week. Matilda calculated the average time slept and calories over the course of a week. She hypothesised that the fewer hours slept, the more calories would be consumed per day. Matilda calculated a Spearman's rank test to see if her results were significant at  $p \leq 0.05$ .
  - State what is meant by the term  $p \leq 0.05$ . (1 mark)
  - Matilda found a negative correlation of  $r_s = -0.66$ . Using a table of critical values, determine whether Matilda's result is significant at  $p \leq 0.05$ . (2 marks)
  - Give two reasons for Matilda using a Spearman's rank test on her data. (2 marks)
  - Explain one weakness of Matilda using a correlation for her study. (2 marks)
- Kenneth wanted to use a correlation to investigate whether there was a relationship between the number of concussions acquired by playing contact sport and anger level. He gathered an opportunity sample of 20 male students who attended a local sports facility. Describe how Kenneth would go about conducting his correlation. (4 marks)
- Matteus wanted to investigate if aggression was genetic by examining genetic relatedness and anger. He used a twin study to analyse outbursts of anger.
  - Describe how Matteus might have carried out a twin study to investigate genetic relatedness and aggression. (3 marks)
  - Explain one weakness of using twin studies to investigate genetic relatedness. (2 marks)
- Assess the correlation as a research method. (8 marks)



# CHAPTER 18 STUDIES

## LEARNING OBJECTIVES

By the end of this chapter you will be able to:

- describe and evaluate the classic study by Raine et al. (1997) on brain abnormalities in murderers indicated by positron emission tomography
- describe and evaluate one contemporary study by Brendgen et al. (2005) on examining genetic and environmental effects on social aggression: a study of 6-year-old twins
- describe and evaluate one contemporary study from a choice of two:
  - McDermott et al. (2008) Monoamine oxidase A gene (MAOA) predicts behavioural aggression following provocation
  - Hoefelmann et al. (2006) Behaviours associated to sleep among high school students: cross-sectional and prospective analysis.

## GETTING STARTED

At this stage in the course, you will have gained understanding into the factors affecting aggression and sleep. You will also have studied research methodology in detail. Imagine that you have been asked to investigate aggression or sleep. In pairs, design your own investigation and make notes about the following:

- your study aim
- your predicted outcome (hypothesis)
- the method you will use
- your sample
- how you would go about conducting the research (procedure)
- how you would present and analyse your data to draw conclusions.

You will not actually be conducting this research, so you can use your imagination.

This is the type of exercise that many researchers undertake before they set about conducting research.

## KEY TERMS

**angular gyrus:** part of the parietal lobe associated with memory, language processing and attention

**corpus callosum:** a band of nerve fibres that join the two hemispheres of the brain together and allow communication between the two parts

**schizophrenia:** a major psychosis characterised by disturbances in thinking, hallucinations and delusions

**thalamus:** part of the brain associated with sensory perception and consciousness

## CLASSIC STUDY BY RAINE ET AL. (1997) BRAIN ABNORMALITIES IN MURDERERS INDICATED BY POSITRON EMISSION TOMOGRAPHY

A pilot study conducted by Adrian Raine et al. (1997) on 22 participants pleading 'not guilty by reason of insanity' (NGRI) and 22 controls found that there was a significant difference in activity of the prefrontal cortex. Specifically, the group of participants pleading NGRI showed prefrontal cortex dysfunctions compared to the 'normal' controls. From this, and other established research, Adrian Raine, Monte Buchsbaum and Lori LaCasse hypothesised that participants pleading NGRI would show brain dysfunctions in areas of the brain associated with violence. Namely, these were the prefrontal cortex, **angular gyrus**, amygdala, hippocampus, **thalamus** and **corpus callosum**.

### AIM

Raine et al. aimed to investigate whether brain activity in murderers differed from a control group of matched non-murderers.

### SAMPLE

The participants consisted of two groups of 41 people: 39 males and two females in each group. The experimental group were 41 criminals with convictions for murder or manslaughter who were being tested to gain evidence to support a claim of NGRI (not guilty by reason of insanity). Of these: six had **schizophrenia**; 23 had suffered organic brain damage or head injury;



## KEY TERMS

**affective disorder:** disturbances in mood or emotion, such as depression

**hyperactivity:** restlessness, impulsivity and excess of physical activity

**paranoid personality disorder:** suspicion and distrust of others

**passive-aggressive disorder:** an unwillingness to engage in social and occupational activity

three were substance abusers; two had an **affective disorder**; two had epilepsy; three suffered with **hyperactivity** and/or learning disability; and two were diagnosed with **passive-aggressive disorder** or **paranoid personality disorder**. All participants in this group remained medication-free for two weeks prior to the PET scan.

The control group had been matched with the experimental group on age and gender. They were all screened for general health, which included a physical examination, access to their medical history and a psychiatric interview. Participants were excluded from the control group if they had a history of seizures, head trauma or substance misuse. Consent was obtained from all participants before the PET scan was administered.

## PROCEDURE

All participants were given a continuous performance task (CPT) to complete, which consisted of a sequence of blurred numbers to focus on. Participants started the CPT as a practice trial ten minutes before being injected with fluoro-deoxyglucose (FDG). After a further 32 minutes on the CPT, a PET scan was then completed to measure the metabolic rate in different areas of the brain in order to look at activity levels in those areas.

## EXAM TIP

In the exam you may be asked to describe the sample or procedure of a study named on the specification. The sample should refer to the participants; the number used and the features of the sample. The procedure should refer to what the participants did during the investigation, but you can also describe the sample/participants for further credit as part of the procedure.

## WIDER ISSUES AND DEBATES

## Ethics

Raine and his colleagues' research was approved by an ethics committee at the University of California, and all participants provided consent to take part. However, the murderers were taking part in the research to build up a case for claiming that they were not guilty by reason of insanity. This raises the question of whether the participants were under duress by their counsel to take part in the research. If the murderers were indeed mentally ill, as they were building evidence to claim that they were, we should question their capacity to consent, especially as they were trying to establish that they were of diminished capacity and could not stand trial. Furthermore, the murderers were being referred for various psychiatric disorders such as schizophrenia, brain injury, substance abuse and personality disorders, likely to diminish their ability to give full consent to take part in the investigation.

## RESULTS

The key findings of the study were that support was found for the hypothesis: brain dysfunction in the NGRI group was in areas previously implicated in violent behaviour. Specifically, compared to the control group, murderers showed:

- lower activity in the prefrontal cortex (both lateral and medial areas)
- lower activity in parietal areas, especially the left angular gyrus and bilateral superior parietal regions
- higher activity in the occipital lobe
- identical activity in the temporal lobe.



In subcortical areas, murderers also showed:

- lower activity in the corpus callosum
- asymmetrical activity in the amygdala (lower in the left, but higher in the right)
- asymmetrical activity in the medial temporal lobe, including the hippocampus (lower in the left, but higher in the right)
- higher level activity in the right of the thalamus.

**SKILLS**

SELF-DIRECTION, CREATIVITY

**ACTIVITY 1**

Draw or create a model of the human brain. On your drawing or model label Raine et al.'s findings. Using pictures and images can reinforce your learning.

**CONCLUSION**

These brain differences have been associated with many behavioural changes that could be related to violent behaviour. For example, dysfunction in the prefrontal cortex has been linked to impulsivity, lack of self-control and an inability to learn from the consequences of behaviour. The hippocampus, amygdala and thalamus have all been related to learning and it has been suggested that abnormal activity here could result in criminals being unable to modify their own behaviour by learning from the consequences of their actions.

**EVALUATION**

The sample used in the research has a number of strengths. It was the largest sample of severely violent offenders to be studied in this way and compared to matched controls, meaning there is good degree of validity in the findings. An effort was also made to eradicate possible effects of medication on brain activity by keeping participants drug-free for two weeks before the scan. The researchers also made an effort to rule out potential confounding variables such as the effect of whether participants were right- or left-handed and possible head injuries suffered. However, one problem with the sample is that it only represents a small number of severely violent offenders as those pleading NGRI are not representative and therefore it cannot be considered a representative explanation of violence. The study focused specifically on a subgroup of violent offenders, but the findings cannot be used as an explanation for other types of violent behaviour or indeed criminality as a whole.

The use of a PET scan provides reliable comparisons to be made between the groups as all participants were subject to the same procedure, allowing an objective measure of the difference in brain activity to be measured. However, the researchers themselves point out that there is some possibility in variation in the procedure for different participants as the images are often taken based on the location of certain brain landmarks within each individual.

There are some ethical issues raised about the use of the PET scan for the control group. A PET scan is an invasive technique involving injecting a radioactive tracer. As the control group did not require a PET scan, it could be said to have caused unnecessary harm. A further ethical issue arises from withholding medication for the offenders with schizophrenia. Schizophrenia is a major clinical syndrome with severe symptoms, so keeping these individuals off medication could have worsened their symptoms.

One limitation of this type of research is that it is impossible to be sure that the brain dysfunction is directly related to the behaviour. There could be a number of possible extraneous variables that could interfere with these findings, such as social or situational factors that may



contribute to either violent behaviour, brain dysfunction, or both. Therefore the research cannot conclude whether violence is due to biology or environmental influences.

The researchers were cautious about the findings. These did support their hypothesis, which was based on some preliminary findings, about whether there was a relationship between these patterns of brain dysfunction and violent behaviour. Some of the findings had not been shown in prior research so, to be sure that they were related to violent behaviour, additional research would need to be conducted.

### **WIDER ISSUES AND DEBATES**

#### **Issues related to socially sensitive research**

Research into the biological causes of crime can be considered to be socially sensitive for a number of reasons. One is that research suggesting that criminality is biologically determined sends out a message that the offenders were not in control of their behaviour, and perhaps they are not criminally responsible. This idea would suggest that we decriminalise certain offences because the offender cannot be held accountable for their actions.

Another reason that this type of research is socially sensitive is because it could be suggested that violent offenders could be detected using diagnostic brain scans, so their future offending behaviour could be predicted and perhaps intervention strategies used to prevent violent crime. This would be a very sinister proposition, particularly as such research is correlational, and it could be that change in brain functioning is a result of violent offending rather than a cause.

Adrian Raine and his colleagues were insistent that criminal responsibility and using PET scans as a diagnostic tool were not the intention of the report, and neither should be pursued as possible ideas because the causality of the findings could not be established with any degree of certainty.

### **CONTEMPORARY STUDY BRENDGEN ET AL. (2005) EXAMINING GENETIC AND ENVIRONMENTAL EFFECTS ON SOCIAL AGGRESSION: A STUDY OF 6-YEAR-OLD TWINS**

Much of the research into causes of aggression has focused on physical expressions of aggression, and occasionally researchers have also considered verbal forms of aggression. Mara Brendgen and her colleagues in this study were interested in the origins of social aggression: aggression characterised by socially manipulative behaviour such as ignoring others, spreading rumours or making threats to withdraw friendship. Social aggression can be both overtly and covertly expressed.

#### **AIM**

The researchers set out with three key aims:

1. To see if social aggression could be caused by genes or the environment.
2. To see if social aggression shared the same cause as physical aggression.
3. To see if one type of aggression leads to another type.

#### **SAMPLE**

Participants for this study were recruited from the Quebec Newborn Twin Study (QNTS) and all were pairs of twins born between November 1995 and July 1998. At the start of the study, 322 pairs of twins were tested, but complete data at all stages was only gathered on 234 twin



pairs. Of these: 44 pairs were MZ males; 50 pairs were MZ females; 41 DZ males; 32 DZ females and 67 pairs were mixed-sex DZ twins.

### PROCEDURE

Data from the sample was gathered longitudinally at 5, 18, 30, 48 and 60 months, and then again at the age of six years and it is this final data that the researchers focused on in this study.

The data gathered consisted of two ratings of each twin's behaviour – one by their teacher and one by their classmates. The ratings were gathered in the spring term of the school year to ensure that the twins were well known by those providing the ratings of their behaviour.

Teacher ratings were based on agreement with a series of statements taken from items on the Preschool Social Behaviour Scale (PSBS-T; Crick et al., 1997) and the Direct and Indirect Aggression Scales (Bjorkvist, Lagerspetz et al., 1992) such as 'To what extent does the child try to make others dislike a child' (social aggression) and 'To what extent does the child get into fights' (physical aggression). The scores given by the teachers for each statement was done on a three-point scale (0 = never; 1 = sometimes; 2 = often). Peer ratings of the twins were done by giving each child in the twins' classes a booklet containing photos of every child in the class.

Every child was then asked to circle three pictures of children that they thought matched four different behaviour descriptions for example, 'Tells others not to play with a child' (social aggression), and 'Gets into fights' (physical aggression). Each twin was given a physical and social aggression score from the teachers' ratings, and any peer selections on the social or physical aggression descriptors that were made of each twin were also recorded.

### RESULTS

Initial findings from the study suggested that there was a much higher correlation between the ratings of MZ twin pairs on physical aggression than between same-sex DZ twin pairs. This was the case in both teacher and peer rating scores for the twins. On the other hand, scores for social aggression were roughly equally correlated in MZ and DZ twin pairs. These findings would suggest that in relation to the first aim, physical aggression may well be caused by genetic factors, whereas social aggression may be better explained by shared environmental factors. In relation to the second aim of the study, a correlation was found between physical and social aggression in the children that was best explained by genes rather than the fact that the twins shared the same environment. This could be the result of aggressive tendencies in general being the result of genetic factors, but the way these tendencies are expressed may be determined by environmental factors such as exposure to other people's aggressive behaviours.

Finally, when looking at the third aim of the study, the data suggested that physical aggression may lead to social aggression, but not the other way around. They concluded that perhaps the expression of aggressive tendencies changes as children grow, as they may learn more 'socially acceptable' ways to show aggression. As young children, they are only able to express aggression physically but, as their language and cognitive skills develop, so do their abilities to demonstrate aggressive behaviour in new ways.

### CONCLUSIONS

The research concludes that there seems to be a strong genetic component to physical aggression but not social aggression, which is more likely due to environmental effects. Children who were physically aggressive were also more likely to display social aggression, probably because of an interaction between genes and environment. As children grow, they tend to become more socially aggressive because of social conventions on physical violence and developing different ways to express themselves.



## SKILLS

SELF-DIRECTION, INTERPRETATION

## ACTIVITY 2

In the examination you may be asked to write about specific issues when evaluating your classic and contemporary studies. It may be useful to draw a table to make sure that the required issues are covered when you are revising. Copy and complete the following table on Raine et al. (1997) and Brendgen et al. (2005) which covers the required issues for evaluation.

Issue	Raine et al. (1997)	Brendgen et al. (2005)
Validity		
Reliability		
Generalisability		
Objectivity/subjectivity		
Credibility		
Ethics		

Make sure you also do this for your chosen contemporary study.

## EVALUATION

The study benefits from taking measures of the twins' aggressive behaviour from two different sources: both teachers and peers. This would suggest that the researchers were validating their findings by looking at two different sources of information, which should eliminate or highlight any bias. The fact that the teachers and peers were in good agreement with each other also adds to the validity of the findings because it would suggest that neither peers nor teachers were giving a seemingly biased view of the aggressive behaviour of the individuals. Asking the children for their ratings in the spring term also meant that the children were more familiar with each other, and therefore better able to judge each other. However, asking children to judge their classmates could result in some children being identified as aggressive by their peers, which could lead to certain children being left out or labelled as bullies.

A strength of the study could be seen in the potential for the research findings to be used to prevent the development of social aggression. If children are showing physically aggressive tendencies then dealing with this may prevent them later expressing this aggression socially. It could be used as an early indicator to parents or teachers that a child's behaviour could become problematic later on, allowing them to intervene early on rather than waiting until the behaviour has become a habit before tackling it. It would be much easier to challenge aggressive behaviour in a small child, while they are still learning, than it would be to change the behaviour of an older child when they have already established a strong sense of their own personality and may be more resistant to change.

One key criticism of the study is the small sample sizes when looking at the different groups being compared. This makes generalisation difficult because the chance of the sample being representative of the entire population would be very low. The reason for the small sample was a consequence of the way in which the study was conducted. Asking six-year-old peers to provide ratings, before they can read and write themselves, obviously meant that the researchers had to record the data with each child individually, which was a time-consuming process and resulted in the small sample achieved. Furthermore, only some of the twins had a DNA test to ensure that they were identical or non-identical (MZ or DZ twins), the remainder were just checked for physical resemblance. Therefore, it could be that some twins who were thought to be monozygotic were not – so affecting the validity of the results.

There could be many possible extraneous variables in the lives of this specific group of twins that may explain the aggressive behaviour shown. However, the researchers themselves justified this criticism by saying that the costs in time and effort associated with individually



▲ Does social aggression lead to physical aggression?



measuring the twins' behaviour across 409 different classrooms meant that selecting an assessment of moderating factors would have been extremely difficult. Another issue with generalising from this sample is that the age group being studied is very specific and it would be impossible to assume that aggression in other age groups will have the same cause. Research has found, for example, that physical aggression reduces when children start school (Nagin and Tremblay, 2001) while social aggression does not fully develop until later in childhood around the age of eight years (Bjorkvist, Lagerspetz et al., 1992). This would suggest that aggression in children from an older age group may be characterised very differently.

In addition to the above classic and contemporary studies, you will also have to learn about one contemporary study from the following two options:

- McDermott et al. (2008) Monoamine oxidase A gene (MAOA) predicts behavioural aggression following provocation.
- Hoefelmann et al. (2006) Behaviours associated to sleep among high school students: cross-sectional and prospective analysis.

### MCDERMOTT ET AL. (2008) MONOAMINE OXIDASE A GENE (MAOA) PREDICTS BEHAVIOURAL AGGRESSION FOLLOWING PROVOCATION

#### KEY TERM

**behavioural economics:** a field of study that combines psychology and economics to study how individuals make decisions

#### LINK

You studied the MAOA gene in relation to aggression on pages 165–166.

Rose McDermott and colleagues combine two fields of psychological research in this investigation: genetics and **behavioural economics**.

The specific field of genetic research investigates the role of the MAOA gene influencing aggression, specifically those individuals with low activity MAOA-L being more likely to develop anti-social behavioural problems in adulthood.

Behavioural economics investigates individuals' decision-making. When making decisions we tend to assume that we make rational choices, often acting in a self-interested way. However, humans can act more altruistically or fairly given some situations, and we can also engage in doing harm to others when there is no individual gain in doing so. The researchers also acknowledge that some cultures are more willing to engage in harm-doing than other cultures.

This research attempts to draw together both fields of psychology to understand the genetics behind decision-making, specifically whether there is any relationship between the MAOA gene and the decision to cause harm when provoked.

#### AIMS

McDermott et al. aimed to investigate whether the MAOA gene was a genetic basis for engaging in aggressive behaviour when provoked.

#### SAMPLE

In 2008 genetic samples were taken from 78 male college students, which determined whether they were either low or high activity MAOA gene carriers. They were divided into two groups, those with MAOA-H and MAOA-L allele (27 per cent were MAOA-L). Women were excluded from this research because of the difficulty in assigning MAOA activity.

#### PROCEDURE

Aggression was recorded by the amount of hot sauce a participant was willing to give an opponent known to not enjoy its taste, in a 'power-to-take' game. The dependent variable was the amount of hot sauce they could forcibly give to the opponent; it was assumed that the more hot sauce the greater the aggression. The participants believed their opponent was an anonymous person in a separate laboratory located in a different part of the campus, but connected to the participant via the internet. This was a deception as there was no opponent; instead a computer generated the response of the 'opponent'.



The 'power-to-take' game involved participants taking a quiz where they completed five multiple-choice vocabulary questions. Each correctly answered question earned the participants 20 points, with an exchange rate of ten points for US \$1. If all five multiple-choice questions were answered correctly, they could earn a maximum of US \$10. In reality the number of points was determined by the researchers and not because they were correct or incorrect. After a short period of time, the opponent decided whether they would steal 0 per cent, 20 per cent or 80 per cent of the money earned by the participant. These stolen points were determined by the computer, and were either 'high take' with 80 per cent of the earnings being stolen, or 'low take' with 20 per cent of the earnings stolen.

Participants were told that their opponent had performed a similar vocabulary task for money, and then were shown the percentage taken by the opponent. Participants were given the opportunity to punish the opponent by forcing them to drink an amount of hot sauce, or trade their allocated (ten teaspoon doses) hot sauce for money. If they traded their hot sauce for money they could earn three points per teaspoon dose, which could be exchanged at ten points per US dollar. Participants could earn a maximum of US \$3 or chose to use some or all of the hot sauce to harm their opponent. The opponent could drink the hot sauce and earn the points, or refuse to drink the hot sauce and the stolen points would be returned to the participant. Participants were also told how their opponent rated the hot sauce, which was fixed at a low level of enjoyment (1,2 or 3 out of 10).

Participants played four rounds of the 'power-to-take' game with who they believed were four different opponents, and had a new supply of hot sauce allocation for each round, each time they could chose to harm their opponent or trade the hot sauce for money. The researchers decided that those who chose to harm an opponent with hot sauce were paying to cause harm to someone who had stolen from them. After the games were complete the participants were fully debriefed.

## RESULTS

Half of the participants in each round had 80 per cent of their earnings stolen, and the other half had 20 per cent of their earnings stolen. As predicted, the researchers found that participants were more likely to behave in an aggressive manner to their opponents (force them to drink hot sauce) when they had 80 per cent of their earnings stolen than when they had 20 per cent of their earnings stolen. In fact 66 per cent of participants who had 80 of their earnings stolen gave their opponent some hot sauce, compared to only 39 per cent of participants who had 20 per cent of their earnings stolen. It was also found that after the first round, those who had 80 per cent of their earnings stolen were more likely to report feeling mad or angry.

Further analysis divided the participants by MAOA genotype. A significant difference in aggression was observed between high and low activity MAOA genotypes when 80 per cent of their earnings were stolen ( $p < 0.01$ ), but no significant differences were found between MAOA genotype when just 20 per cent of their earnings were stolen ( $p = 0.19$ ).

TABLE 18.1: PERCENTAGE OF MAOA-H AND MAOA-L PARTICIPANTS WHO GAVE SOME HOT SAUCE WHEN THEIR EARNINGS WERE STOLEN

	MAOA - L	MAOA - H
Participants who gave some hot sauce when 80 per cent of their earnings was stolen (%)	75	62
Participants who gave some hot sauce when 20 per cent of their earnings was stolen (%)	40	34



When the researchers analysed those participants who gave the maximum amount of hot sauce to their opponent, they found that more MAOA-L participants were willing to sacrifice the maximum US \$3 pay to harm their opponent than MAOA-H participants.

TABLE 18.2: PERCENTAGE OF MAOA-H AND MAOA-L PARTICIPANTS WHO GAVE THE MAXIMUM AMOUNT OF HOT SAUCE WHEN THEIR EARNINGS WERE STOLEN

	MAOA - L	MAOA - H
Participants who gave the maximum amount of hot sauce when 80 per cent of their earnings was stolen (%)	44	19
Participants who gave the maximum amount of hot sauce when 20 per cent of their earnings was stolen (%)	12	6

This shows a significant difference between MAOA-L and MAOA-H participants willing to deliver the maximum amount of hot sauce after losing 80 per cent of their earnings ( $p < 0.01$ ).

## CONCLUSIONS

McDermott et al. concluded that the greater the provocation, through loss of earnings (80 per cent), the more aggressive people are towards those responsible. This willingness to incur a financial loss to oneself in order to harm another suggests that they were acting in spite towards the opponent. They also concluded that genetics were likely to interact with this finding as participants with low activity MAOA were more aggressive than high activity MAOA when 80 per cent of their earnings were stolen. This suggests that MAOA-L participants were more aggressive in the face of provocation. This research supports a gene-environment interaction being involved in aggression.

## EVALUATION

This study extends previous research into aggression by examining aggressive behaviour rather than self-reported aggression. However, forcing an unseen opponent to drink hot sauce is not particularly realistic of real-life aggression in a social context where the opponent can be seen and heard. This means that the study may lack ecological validity, which means that we cannot be sure that individuals with MAOA-L would be more aggressive when provoked face to face. We can also question whether forcing someone to drink hot sauce is a valid measure of behavioural aggression. Not least because it is an unusual task and does not represent aggression in daily life, which would tend to be more verbal or even physical in nature. This means that we cannot draw conclusions about how MAOA-L individuals are likely to respond to provocation in an everyday context.

Laboratory experiments like this one suffer from participants altering their natural responses in an artificial situation. The students were playing a game and they may have thought that they should use the allocated hot sauce to punish the opponent. But this does not mean that they would have done so if they were in a real-life context and were not playing a game. Because they did not see the opponent drink the hot sauce, they may also have thought that it was a hoax. This criticism can be supported by the eight participants whose data was withdrawn from the analysis post experiment because they expressed disbelief that anyone was actually drinking the hot sauce. Maybe others guessed it was a hoax too but failed to express their doubt in anyone actually drinking the hot sauce.

One strength of this study is that it used a highly controlled and standardised procedure, where all participants were subject to the same game and condition manipulations, each participant



earned a fixed number of points from the game and the same amount of points were stolen. Furthermore, the researchers randomised earning and stealing conditions across participants, and the amount of hot sauce administered was an objective measure of aggression.

However, the experiment involved a significant amount of deception as the students were unaware that the opponent was not real and that no hot sauce would be drunk. Deception is never desirable in any psychological research, and the participants in this study may have genuinely thought that they were inflicting harm on another person, which could have caused them distress. However, the ruse was a necessary part of the procedure to ensure that participants thought that they inflicting pain so they could accurately measure aggression.

A further weakness of this study is that only male students were studied. This means that any gene-environment interaction reported may not extend to explain female aggression to provocation, or beyond a student population.

### WIDER ISSUES AND DEBATES

#### Nature–nurture

McDermott et al.'s research suggests that genes in isolation cannot sufficiently explain aggression, but that there is an interaction between genes and the environment because significant provocation was necessary to induce the participant to inflict pain on the opponent.

### HOEFELMANN ET AL. (2006) BEHAVIOURS ASSOCIATED TO SLEEP AMONG HIGH SCHOOL STUDENTS: CROSS-SECTIONAL AND PROSPECTIVE ANALYSIS

Luana Hoefelmann and colleagues were interested in factors affecting sleeping. It has been well established that sleep is essential for memory and learning, and is directly associated with hormonal and behaviour regulation. Yet it is also known that young people get insufficient sleep, which may be due to maturational factors, and factors associated with school commitments and use of social media/electronic devices.





## AIMS

The study aimed to investigate factors affecting sleep in high school students. Specifically it aimed to measure various lifestyle factors affecting quality and duration of sleep among the students.

## SAMPLE

The sample initially included approximately 2 000 students who were randomly selected from 20 schools. The students were aged 14–24 years old and enrolled in night classes at public schools in Florianopolis (Santa Catarina state, southern Brazil) and Recife (Pernambuco state, northern Brazil). Ten schools from each municipality were selected. A total of 989 students completed the initial assessment and also the post-intervention assessment.

## PROCEDURE

In March 2006, and then nine months later in December 2006, the students answered a questionnaire which included closed-ended questions on sleep and lifestyle in their school classrooms. Some of the questions on physical activity, eating habits and other lifestyle factors were based on the Patient-centred Assessment and Counselling for Exercise plus Nutrition (PACE+) project questionnaire, and followed a standardised procedure conducted by a trained team of physical education and nutrition students and teachers.

Quality of sleep was measured using the question 'How often do you think that you sleep well?', the answer options for which were 'always, almost always, sometimes, almost never, or never'. 'always and almost always' were judged as good and the remaining judged as poor. The amount students slept was measured using the question 'How many hours, on average, do you sleep per day?', answers under eight hours were judged as insufficient sleep, and eight hours or more as sufficient sleep.

The questionnaire also measured the frequency of physical activity, exercise for muscular strength, daily time spent watching television and playing computer games, snack and soft drink consumption per week.

The research involved a **cross-sectional design** and **prospective design**. The cross-sectional design included gender (female or male), age group (14–16 years, 17–19 years and 20–24 years of age), skin colour (white and non-white), marital status (single or non-single), occupation (working, intern, non-working), lives with family (yes or no), and municipality (Florianopolis or Recife). The cross-sectional analysis was conducted on the initial questionnaire. The prospective analysis (longitudinal study) compared the questionnaire data from March 2006 to the questionnaire data from December 2006.

The study was approved by the Ethics Committee of the Federal University of Santa Catarina and the Instituto Materno Infantil de Pernambuco. **Negative consent** was obtained from parents of students under age 18 years, and consent was gained from students aged 18 years or older.

## RESULTS

In the cross-sectional analysis, eight in every ten students surveyed reported that they had insufficient sleep and five in every ten students self-reported poor sleep quality. Students who had a lower frequency of physical activity were less likely to report poor sleep quality, however, high snack consumption was significantly associated with poor sleep quality. For sleep duration, students who had higher muscular strength/exercise endurance, higher snack consumption and higher levels of TV watching were less likely to report a lack of sleep; whereas those who reported a higher frequency of soft drink consumption slept less.

In the prospective analysis, no behaviours were associated with sleep quality. The researchers also found that five in every ten students reported poor quality sleep and eight in ten reported insufficient sleep in the initial questionnaire and again nine months later.

## KEY TERMS

**cross-sectional design:** involves collecting data from a population or sample at a single point in time; the data is typically divided into groups or characteristics of a population

**negative consent:** when individuals are given the opportunity to decline to take part in research

**prospective design:** a study where researchers collect data from participants over a period of time to observe changes or trends



TABLE 18.3: PERCENTAGE OF STUDENTS REPORTING SLEEP QUALITY, DURATION AND LIFESTYLE FACTORS

% responses	Cross-sectional	Prospective
Sleep quality		
Poor	45.7	45.8
Good	54.3	54.2
Sleep duration		
8 hours and over	23.3	22.5
Under 8 hours	76.7	77.5
Physical activity for 60 minutes per day		
5 or more days per week	45.3	32.9
Less than 5 days per week	54.7	67.1
Snack consumption		
5 or more days per week	25.5	20.4
Less than 5 days per week	74.4	79.6
Soft drink consumption		
5 or more days per week	35.1	29.4
Less than 5 days per week	64.9	70.6
Time spent watching television		
Less than 2 hours per day	37.8	41.5
2 hours or more per day	62.2	58.5

### CONCLUSIONS

The prevalence of poor sleep quality and insufficient sleep duration is high among students in Brazil, and remains stable over extended periods of time, in this study over nine months. The cross-sectional analysis of the initial questionnaire data revealed that some lifestyle factors were associated with poor quality and duration of sleep, but the prospective analysis failed to confirm this association.

### SKILLS

CRITICAL THINKING, ANALYSIS,  
DECISION MAKING

### ACTIVITY 3

Conduct your own survey into quality of sleep and snack consumption, or different variables, using Hoefelmann et al.'s ratings. Calculate the percentage of participants who rate good/poor quality sleep and more/less snack consumption. Compare your findings with Hoefelmann et al.

### EVALUATION

One weakness of this study is that all of the data gathered about sleep duration, quality and lifestyle were self-reported by the participants. Some participants may not have answered questions concerning lifestyle choices truthfully, for example under reporting how many snacks they consumed or exaggerating how much exercise they did. Without verifying the data using other measures, we cannot be sure that this study presents an accurate account of the participants' lifestyles.



Furthermore, people's perception of sleep quality is subjective and influenced by emotional factors. Teenagers in particular may experience emotional changes which can influence how they perceive the quality of their sleep, so we cannot be certain that a quarter to a third of people suffer insufficient sleep in a more emotionally stable population. The study also failed to control for factors affecting sleep, as the researchers did not ask participants whether they had any sleep disorders or issues with sleep. We know that poor sleep quality can result from various sleep disorders, and this was not taken into account.

A further weakness of this study was that the prospective analysis was conducted in a relatively short period of time, only nine months, which may be too limited to detect an associations between lifestyle choices and sleep. Furthermore, there was a significant loss of participants between March and December, more than 50 per cent of the original participants were not followed up, which means that the researchers could not form a whole picture of the original cohort.

One strength of this research is that identifying lifestyle factors that affect sleep could be used to promote more healthy lifestyle choices among young people. Other research indicates that sleep is important for memory and learning, and also psychological well-being, so this research could be used to inform health campaigns which may prevent mental health issues. However, the research is correlational, so the researchers cannot be sure whether unhealthy lifestyles lead to poor sleep or that poor sleep in some way promotes unhealthy lifestyles.

The sample of students used also raises an issue with the generalisability of this investigation. Only students enrolled in night classes were sampled so it may be unsurprising to find that the students had poor quality sleep and spent less time sleeping. Students attending night classes may not be typical of students who do not attend night classes, so the findings may not be representative of sleep and lifestyle across young people across Brazil and therefore the study lacks population validity. Students who attend night classes may be more vulnerable to making unhealthy lifestyle choices and have less time to engage in exercise and healthy eating. Other research has shown that physical exercise is positively correlated with quality of sleep, which was not found in this study, so the reliability of this finding may be questioned.

The study was granted ethical permission by two ethical committees, however, negative consent assumes that individuals agree to take part unless they actively opt out. This technique may not give individuals sufficient opportunity to make informed choices about their participation as they do not give explicit agreement, and the burden of refusing to participate is with the participant. This burden may act as a form of pressure to take part to avoid any consequences of opting out. It may also be true that those participants under the age of 18 years did not know that they would be participating because they were not informed by their parent or guardian.

**SKILLS****ANALYSIS, INITIATIVE,  
DECISION MAKING****ACTIVITY 4**

For your chosen contemporary study, categorise each evaluation point into a strength or weakness. Copy the table on the next page – we have begun this one as an example. Decide whether each evaluation point refers to validity, ethics, reliability, generalisability, application or objectivity/subjectivity. Once you have categorised and labelled each evaluation point, you will be in a better position to judge the overall credibility of a study. This will also help formulate a conclusion about the study.



EXAMPLE: HOEFELMANN ET AL. (2006)

Categorised evaluation points	This point refers to validity, ethics, reliability, generalisability or objectivity/subjectivity	Decide whether the study is credible
<b>Strengths:</b> Two ethical committees granted permission One application is that healthier lifestyle choices could be promoted to encourage mental health	Ethics  Application	
<b>Weaknesses</b> Negative consent did not give sufficient opportunity to refuse to participate Only students enrolled on night classes were sampled	Ethics  Generalisability	

## SKILLS

CRITICAL THINKING,  
PROBLEM SOLVING

## CHECKPOINT

- Identify which study used the following samples of participants:
  - 78 male students with high or low MAOA activity
  - 234 twin pairs recruited from the Quebec Newborn Twin Study
  - 41 murderers pleading not guilty by reason of insanity
  - 989 students enrolled in night classes in two municipalities in Brazil
- A dependent variable is something that is measured by researchers. Try to identify which study used which dependent measure:
  - The amount of hot sauce given to an opponent
  - Answers to the question 'How often do you think you sleep well?'
  - Metabolic activity in different areas of the brain
  - Answers to the question 'To what extent does the child get into fights?'
- Identify which study used which controls:
  - The questionnaires were administered by trained physical education teachers and students.
  - The continuous performance task was started ten minutes before the FDG tracer was injected.
  - Participants played the same game, earned the same points and had the same amount of points stolen.
  - Teacher and peer ratings were taken to validate the scoring of social and physical aggression.



## SKILLS

## EVALUATION

## EXAM PRACTICE

1. Describe the sample used by Brendgen et al. (2005). (2 marks)
2. Explain one improvement that could be made to Raine et al.'s (1997) study of brain activity in murderers. (2 marks)
3. During your studies of biological psychology, you will have learned about one of the following contemporary studies in detail:
  - McDermott et al. (2008)
  - Hoefelmann et al. (2006)
  - a) Describe the procedure of your chosen study. (3 marks)
  - b) Explain two weaknesses of your chosen contemporary study in terms of validity. (4 marks)
4. Evaluate Raine et al (1997) classic study. (8 marks)

## EXAM TIP

If you are asked to suggest an improvement to a study, make sure that your improvement is clear and justified. Also check that the suggestion would improve the research.

## EXAM TIP

You need to have thorough knowledge of your classic and contemporary studies, so you should make sure you have knowledge of the aim, method, sample, procedure, results and conclusions (AMSPRC is a useful acronym to use). If you are asked to describe the study, try to mention details about AMSPRC in your answer. However, be mindful that the question could ask about just one element of AMSPRC.



# CHAPTER 19 PRACTICAL INVESTIGATION

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- design and conduct a correlational study, which should be about aggression or body rhythms
- make design decisions when planning and gathering data
- analyse correlational data including conducting an inferential test for a relationship
- evaluate strengths and weaknesses of the correlation and suggest improvements
- write up the procedure, results and discussion section of a report on your investigation.

## GETTING STARTED

Throughout this topic you have studied various causes of aggression and factors influencing body rhythms. This section suggests one area that could be used for your investigation, but there are other areas that you may consider for your practical investigation.

The following are some suggested titles for investigations you could consider. In pairs, for each title discuss how you would go about designing the research. Then rate each title on a scale of 1–10 for preference (considering issues of ethics and practicality):

An investigation into sleep and age	An investigation into the severity of premenstrual tension and hours spent sleeping	An investigation into time spent on social media and time spent sleeping
An investigation into the correlation between height and self-reported aggression	An investigation into the relationship between premenstrual tension and self-reported aggression	An investigation into age and self-reported aggression
An investigation into physical exercise and sleep quality	An investigation into sleep quality and unhealthy snacking	An investigation into self-reported aggression and incidents of contact sport injury

## DESIGN AND CONDUCT A STUDY

You are going to carry out your own practical investigation: you will design and conduct a correlational study, which should be about aggression or body rhythms. So first you need to consider your research question and refine your aim, state your hypothesis, consider the design, controls, find a sample and deal with the ethical issues.

### AIM

Correlational research investigates the relationship between variables, specifically how strong a relationship it is and whether it is positive or negative. This topic is about biological psychology, so here you could look for a link between a biological variable and a behavioural one, in particular one relevant to aggression or body rhythms

All studies start with a research question. For example, 'Is there a link between the **masculinity** of a person and aggressive behaviour?' So an aim would be 'To investigate whether there is a link between the masculinity of a person and aggressive behaviour'.

### KEY TERM

**Masculinity:** characteristics stereotypically attributed to being a man/boy



## HYPOTHESES AND VARIABLES

In this case, your alternative hypothesis might be: 'There will be a significant positive correlation between masculinity and aggression.' This is a directional hypothesis because it is predicting the specific nature of the relationship. The null hypothesis is that there will be no relationship between masculinity and aggression and any relationship found will be due to chance.

The next stage would be to operationalise both co-variables, which means that you have to work out how they are to be measured exactly. For example, you could get participants to do a masculinity quiz that gives a score about masculinity of the brain, and then observe the person play a moderately violent video game that would allow you to get an aggression score. The aggression score will be calculated by how many characters in the game they knock down. The player receives one point for each character they knock down. The hypothesis can now be refined to include an operational definition of the measured co-variables; for example, there will be a significant positive correlation between a participant's masculinity score on a quiz and their scores on a moderately violent video game.

## DESIGN

Correlational designs measure two variables and then calculate the exact nature of the relationship between them. In this study, you would have to measure the masculinity of participants then, for the same people, measure their aggressiveness. Both variables must be at least ordinal level of measurement.

## CONTROLS

You should try to ensure that as far as possible you have controlled for other variables that could impact on either of your measures (masculinity score and aggressive acts in video game). For example, when masculinity is measured, all participants ought to be tested in the same way and their scores should be capable of objective measurement; for example, you could use a computerised test that gives a masculinity score.

In measuring aggression you would need to make sure that all participants are equally proficient at the video game. This might mean that you have to invent one in order to control for prior exposure and practice, and that everyone participates with the game in exactly the same circumstances to rule out extraneous variables.

## FINDING A SAMPLE

Once you are satisfied you have the materials necessary to run the study you should recruit a sample of participants. You should use the most appropriate sampling technique.

### LINK

For a detailed discussion of sampling techniques see pages 41–43.

The sample should be representative of the target population that you wish to apply your findings to – in this case the male general public. At the point of recruitment, you must make them aware of the aims and nature of the study so as they can make an informed decision as to whether to participate or not.

There are several methods available to gather a sample. In this practical example, an opportunity sample could be used as it is quick and easy to do, but because testing might take up quite a lot of time it might be better to get a volunteer sample of people who are willing to give up an afternoon; you could do this through advertising on workplace or college noticeboards or online. You should aim for about ten participants, in this case male participants.



Although samples gathered using volunteer or opportunity sampling methods are not typically generalisable to the general population, in this investigation there will be certain ethical implications with asking participants to play a violent video game, so representativeness will be compromised for ethical reasons.

### ETHICS

It is important to deal with the ethical issues before the participants start the study. They should be clearly informed as to the nature of the study, what you are investigating and what they will be required to do.

If and when participants consent to take part, you should notify them that they are free to withdraw at any point and to take their data with them. You should ensure that their data is kept confidential so that any information you get about the participant will not be shared with anyone else. You should keep their data anonymous by replacing names with a number, and any data should be destroyed in a reasonable time frame.

You must ensure that your sample participants are all able to give their consent and that no one under the age of 16 is included. For this investigation it is important that all participants are over the age of 16 because they will be asked to play a video game that involves some aggression. The video game must be age appropriate, and all participants must be informed that they will be expected to play this type of game before the study begins.

A consent form should contain the following information.

- What the aim(s) of the study are.
- Exactly what they will be expected to do – in full detail so that participants can decide whether or not they want to take part.
- Any possible implications for the participant – in this example they will need to know the possible implications of playing an aggressive video game.
- A clear statement that the participant can withdraw at any point without consequence.
- A reassurance that their data will be anonymised and destroyed after a certain date.
- Who else will see the findings and how the information will be distributed.
- Your contact details and the details of your supervising teacher/school/college.
- The signatures of the researcher and participant.

Before you conduct a study, it is worth doing a run through of the procedure using a pilot study. This will highlight any procedural and ethical issues that you may have overlooked in your planning. You will need to pilot the video game and the masculinity quiz, check your instructions are understood by all participants, your timings are appropriate and that your venue is suitable for the study. A pilot study is a dry run rather than a measure of whether your variables work or whether the study is reliable or valid.

### DEVELOPING A PROCEDURE

Now you can set up the study. Think about what you will need in order to measure your variables and how you will get them. In this example, you might get all your participants to do the masculinity test while supervised to ensure that no other variables might affect their concentration and their ability to give it full attention. You would need to think through how to do this, for example, have all participants together working on a bank of computers so that less researcher time is needed.

As a researcher you will need to use a standardised procedure to gather your data, which you will then carefully write up in your report of the investigation. It must be detailed enough to allow for others to replicate what you did and test whether they too get the same results as you, so you must include all instructions to the participants and a step-by-step run through of the study. For example, once the participants have been recruited, you could set up a time



for them to come to the lab to establish their masculinity score. This could be all at the same time, or it could be separately. You would need to work out how you will measure aggression on the video game.

## EXAMPLE REPORT

The study took place over one afternoon between the hours of 2 p.m. and 4 p.m. Following the initial briefing and once participants had given their informed consent, ten volunteer participants (aged between 19 and 52 years old) were gathered in a lounge area in the university and were allocated a number. They were then shown into an IT room and each person was seated in front of a computer preloaded with a masculinity quiz. They were allowed as much time as they needed to complete the test. The fastest time was 25 minutes and the slowest was 42 minutes. The test was done in silence and was supervised by the researcher who recorded their score against their allocated number once they completed the test. The scores were calculated as part of the computer program.

Once each participant had completed the test they returned to the lounge area and were asked to wait until called. Refreshments were available while they waited. They were then shown into one of two small lab rooms. Each participant was seated alone at a laptop set up with a bespoke computer game that required them to do moderate acts of aggression to score points. They were supervised at all times by a research assistant who had minimal interaction with them other than to set up the game and input their participant number.

The game offered a practice session lasting three minutes and then a five-minute data-gathering session. All instructions appeared on the screen. The participant's score was logged by their number. Once the game was complete they met with the main researcher in another small room and were debriefed individually or in pairs, and reminded of their right to withdraw. Any questions they had were answered and they were offered the chance to see the results once available.

They were thanked for their participation, asked whether they wished to offer any insights into their experience of the study and released.

## ANALYSING RESULTS

Analysing correlational data requires that there are two scores from related sources; in this case, the source is each participant and the two scores are their masculinity score from the quiz and their aggression score from the video game. This data must be at least ordinal.

The data from the video game provided an aggression score for the participants between 0 and 20 where a low score represented low levels of aggression.

The data from the masculinity quiz was calculated by the computer program. A high score indicated a high level of masculinity. The maximum score possible was 100 and the minimum was 25.



The data should initially be tabulated as follows.

TABLE 19.1: PARTICIPANT DATA FOR MASCULINITY AND AGGRESSION SCORES

Participant number	Gender	Masculinity score	Aggression score
1	M	56	17
2	M	69	18
3	M	30	10
4	M	88	10
5	M	80	15
6	M	87	16
7	M	95	17
8	M	67	15
9	M	77	14
10	M	45	6

#### LINK

Information on calculating descriptive statistics can be found on page 76.

#### DESCRIPTIVE STATISTICS

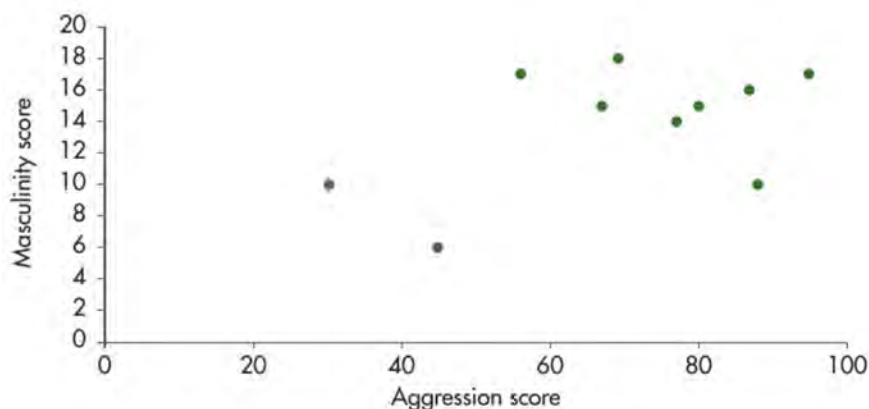
While descriptive statistics (mean, median, mode, range and standard deviation) are not typically associated with correlational analysis. Nevertheless, they can be useful when comparing variables.

TABLE 19.2: DESCRIPTIVE STATISTICS FOR MASCULINITY AND AGGRESSION SCORES

Descriptive statistic	Masculinity score	Aggression score
Mean	69.4	13.8
Median	73	15
Mode	—	10, 15, 17 (not useful)
Range	65	12

#### PRESENTING AND ANALYSING CORRELATIONAL DATA

The scatter diagram in Figure 19.1 does not illustrate any definite linear relationship between the co-variables, but there is a slight trend from the bottom left to top right that could demonstrate a potential weak positive correlation.



► Figure 19.1 Scatter diagram to show the relationship between masculinity quiz score and aggression score on video game



By looking at the scatter diagram you can see the nature of the relationship and get a rough idea of its strength. However, to accurately gauge the strength of any relationship you will need to do a statistical test, and for a correlation you will need to conduct a Spearman's rank test. If you have gathered interval or ratio data, this will be reduced to ordinal level data when it is ranked during the procedure of the test.

The co-variables will need to be ranked and then the differences between the ranks for each co-variable calculated and the sum of rank differences found.

TABLE 19.3: RANKING OF CO-VARIABLES FOR MASCULINITY AND AGGRESSION SCORES

Participant number	Masculinity score (A)	Aggression score (B)	Rank A	Rank B	$d = \text{rank A} - \text{rank B}$	$d^2$
1	56	17	3	8.5	-5.5	30.25
2	69	18	5	10	-5	25
3	30	10	1	2.5	-1.5	2.25
4	88	10	9	2.5	6.5	42.25
5	80	15	7	5.5	1.5	2.25
6	87	16	8	7	1	1
7	95	17	10	8.5	1.5	2.25
8	67	15	4	5.5	-1.5	2.25
9	77	14	6	4	2	4
10	45	6	2	1	1	1
$\Sigma d^2$						112.5

### CALCULATING THE VALUE OF $R$

1. Rank the scores on one of the variables giving 1 to smallest score and so on.
2. Do the same for the other group of variables.
3. Calculate the difference ( $d$ ) between the ranks for each score.
4. Square each difference ( $d^2$ )
5. Find the sum of the squared differences.
6. Count the number of participants ( $n$ )
7. Find the value of  $r_s$

### MATHS TIP

When ranking scores you might find it easier to keep tabs on what is happening if you write out your ranks first, so if you have ten bits of data, write out the numbers 1–10 and then score them off as you allocate the rank, this is especially helpful when you have tied data. For example:

Number position	1	2	3	4	5	6	7	8	9	10
Scores for B	6	10	10	14	15	15	16	17	17	18
Ranks for B	1	2.5	2.5	4	5.5	5.5	7	8.5	8.5	10

So the score of 6 gets ranked 1, and the scores of 10 get the average of the number positions they occupy, in this case the average of 2 and 3 number positions is 2.5, and the next score of 14 is given the rank of 4 and so on until the last rank of 10 is given to the highest score of 18.



## SKILLS

SELF-MONITORING,  
SELF-EVALUATION,  
SELF-REINFORCEMENT

## ACTIVITY 1

Practise ranking data using the following scores:

4, 9, 6, 1, 3, 4, 7, 9, 2, 6

Copy the following table and use it to keep track of your ranking:

Number position										
Scores (in ascending order)										
Rank										

Spearman's rank formula:

$$r_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

Applied to this analysis:

$$r_s = 1 - \frac{6 \times 112.5}{10(10^2 - 1)} \quad r_s = 1 - \frac{675}{10 \times 99} \quad r_s = 1 - \frac{675}{990} \quad r_s = 1 - 0.682 \quad r_s = 0.318$$

The correlation coefficient ( $r_s$ ) = 0.318

The final stage in the statistical analysis is to find the critical value appropriate to the data; this means using a critical values table for Spearman's rank.

The study had a directional or one-tailed hypothesis that there would be a positive relationship between masculinity quiz scores and aggression scores, so a one-tailed test will be used. The minimum level of probability acceptable in psychological research is 0.05 level, and there were ten participants ( $n = 10$ ). Using this information, the observed/calculated value of Spearman's rank of 0.318 is compared with the critical/table value, which it has to be equal to or greater than if the result is to be considered significant.

TABLE 19.4: EXTRACT FROM CRITICAL VALUES TABLE

	Level of significance for a one-tailed test			
	0.05	0.25	0.01	0.005
	Level of significance for a two-tailed test			
$n$	0.1	0.05	0.025	0.01
4	1.000	1.000	1.000	1.000
5	0.900	1.000	1.000	1.000
6	0.829	0.886	0.943	1.000
7	0.714	0.786	0.893	0.929
8	0.643	0.738	0.833	0.881
9	0.600	0.700	0.783	0.833
10	0.564	0.648	0.745	0.794



In order to be significant, the observed (calculated) value of  $r_s$  should have been 0.564 or greater. But it is not, so in this case we must accept the null hypothesis and reject the alternative hypothesis because the probability of the results occurring by chance was greater than 5 per cent. There is no evidence of a significant relationship between masculinity of the brain and aggressive responses to a computer game.

### SKILLS

SELF-MONITORING,  
SELF-EVALUATION,  
SELF-REINFORCEMENT

### ACTIVITY 2

Practise using the critical values table for the Spearman's rank test on the following findings. Compare each finding to the appropriate critical value and state whether the findings are significant or not.

Researchers calculated  $r_s = 0.600$  for a one-tailed test with  $n = 10$  at a  $p \leq 0.05$

Researchers calculated  $r_s = 0.543$  for a one-tailed test with  $n = 8$  at a  $p \leq 0.05$

Researchers calculated  $r_s = 9.10$  for a two-tailed test with  $n = 6$  at a  $p \leq 0.01$

Researchers calculated  $r_s = 0.600$  for a one-tailed test with  $n = 9$  at a  $p \leq 0.1$

If our variables are positively related, then we should expect that participants who score low on one measure will also score low on the other, and similarly for those who score high. If they are negatively related, then we would expect that those who score low on one variable will score high on the other. So if the variables are ranked separately, high ranks for one variable should mean high ranks on the other if there is a positive correlation. If there is no correlation then there is simply a chance distribution of scores, so rank of score on one condition is unrelated to rank on the other.

### PRESENTING FINDINGS

State whether the null hypothesis should be accepted or rejected based on the analysis of the data. Researchers must provide enough data to allow the reader to understand that decision. Raw data ought to be available, although only as an appendix to the final report, however the descriptive statistics including tables and graphs must be included at the point of presenting findings in the results section of the report.

The conclusion of the inferential statistical analysis must also be stated in the following format:

The calculated value of the Spearman's rank test was  $r_s = 0.318$ . This was less than the critical value of 0.564 for a one-tailed test at  $p \leq 0.05$  with  $n = 10$ . Therefore the result is not significant and the null hypothesis can be supported, which states that there will be no relationship between masculinity and aggression, and any relationship found was due to chance.

### EXAM TIP

In the examination you may be asked to draw conclusions from a statistical test. It is important to write about your decision-making when drawing your conclusion. Make sure you state the following when making a statistical statement:

- the calculated value
- the critical value
- the probability level/level of significance
- the number of participants
- whether it was a one-tailed or two-tailed test
- whether the calculated value was greater/less than or equal to the critical value for significance to be shown
- what hypothesis is supported (restate this hypothesis).



TABLE 19.5: SIGNIFICANCE OF FINDINGS

$r_s$ observed = 0.318	$n = 10$	$p > 0.05$ (one tailed)	$r_s$ cv = 0.564
Calculated statistic from the test done on your data	Number of participants contributing data	Probability of result being significant determined by comparing calculated statistic ( $r_s$ ) with table value at specific level of significance. In this case, the result shows that the probability was greater than 5%	The critical value for $n = 10$ at the 5% level drawn from the appropriate table for Spearman's rank order correlation coefficient table of critical values

### DRAWING CONCLUSIONS

Once the data has been gathered and analysed you will be able to state whether you reject the null hypothesis or not.

You cannot be reasonably certain that a genuine relationship existed for this study because of the inferential test results, but this does not mean that other factors did not influence the data and therefore challenge the validity of any conclusions drawn.

In considering the findings of any investigation the researcher must examine the validity and reliability of the method and procedures used to gather data.

### VALIDITY

Were the variables truly a measure of the concepts being tested? In this case, was the masculinity quiz a true measure of masculinity and the video game a true measure of aggression? The use of the quiz could, however, challenge this measure as a valid reflection of masculinity as it is very superficial and ignores many other factors that influence masculinity, such as social roles and norms of behaviour. The computer game could also be challenged as lacking ecological validity in the way that it measured aggression, sitting at a screen and manipulating virtual characters for points does not necessarily translate into real-world aggressive tendencies, which are likely to be constrained by social regulations.

It could be argued that the number of times a character was hit in the game was merely a reflection of the rules of the video game and not an indication of aggression.

With any correlation, we cannot actually establish a causal relationship between aggression and masculinity as there might be a third variable that affects both co-variables that are not included in the analysis.

### RELIABILITY

Were the procedures used a consistent test of aggression and masculinity? The use of the standardised procedures and the objective measures in the example practical investigation increase the reliability of the data, so it is realistic to expect that the procedure could be replicated and that another researcher could consistently record and interpret the data on both measures in the same way as in this study.

However, there are still challenges; for example, for some participants doing the quiz first might have alerted them to the goals of the study, which may have affected how they performed on the video game. Some students also had longer between the quiz and the video game, this might have relaxed them and so they would not operate at the same level of focused attention as others who did it straight away. Also, although the study ensured that no participant had prior knowledge of the game itself and all participants had the same amount of practice time, it might be that some participants were experienced gamers and had a higher generic skill that could



have led to them scoring more points. This means that we measured gaming performance rather than consistently measuring aggression.

If the study had used a questionnaire to measure aggression then there might have been more issues with accepting the measure as reliable.

### GENERALISABILITY

In the example study the sample size was small at only ten people and, although a range of ages was tested, it might be that the sample is not representative. This could be especially true because it was a volunteer sample so those who came forward might represent only a certain type of person. Volunteers tend to have a more compliant personality, so perhaps they could have altered their behaviour to meet the expectations of the researcher.

The amount and type of aggression displayed in different cultures and subcultures are very different. Some cultures nurture aggression while others actively prohibit it. Because this example practical investigation is based on a sample of participants who are from an industrialised Western culture, the study can be regarded as ethnocentric and the findings may not apply to other cultures. The study is also limited to explaining male behaviour, so cannot be applied to explain female aggression.

## WRITING UP THE REPORT

When writing up a psychological investigation it is important to follow the conventions of reporting. This involves carefully documenting the procedure, results and discussion. You will learn about the conventions of psychological reporting in Student Book 2.

### THE PROCEDURE

When writing up the procedure it is important to have all the elements of what was done written in full. You should write the following points.

- The sample: who was used, how many, from where, and the sampling technique used.
- The apparatus used and how the data was scored.
- The design used (typically this would be repeated measures for a correlational study as both variables are recorded for every participant).
- The brief, standardised instructions and debrief used with participants.
- The location of the study, and who was present.
- Whether participants were tested individually or in groups.
- What the participants did during the investigation (procedure, timings).
- Controls that were put into place.

### THE RESULTS

When writing up your results you should include:

- the raw data table
- the descriptive statistics
- a scattergraph to graphically present your data, and an interpretation of the strength and direction of your data
- the Spearman's rank test and a statement of statistical significance.

### THE DISCUSSION

The discussion section of a report should be where conclusions about the data are drawn from the data analysis. This is where the findings are explained with a wider context of background theories and previous research in the area. It is a section where the researchers



suggest limitations and strengths of the investigation and possible improvements that could be made to the methodology used. A discussion section also offers practical uses of the findings and potential implications for the knowledge with a wider context such as organisations, education, clinical practice or society as a whole.

### IMPROVING YOUR PRACTICAL INVESTIGATION

When considering improvements to your practical investigation you could consider the following:

- Was the sample representative? If not how could it be made more representative?
- Was the procedure standardised? If not how could it be made to be standardised?
- Were there any issues with lack of control? What controls could be used?
- Were the variables operationalised in such a way that they measured what was intended? How else could the variables be operationalised more effectively?
- Were any aspects of the data collection or analysis subjective? How could it be made more objective?
- Were there any unforeseen ethical issues? How could ethics be improved?

#### SKILLS

CRITICAL THINKING,  
INTERPRETATION,  
EXECUTIVE FUNCTION

#### CHECKPOINT

When conducting a correlation study it is important to know the facts about a correlation. Here are some statements about a correlation study. Decide which statement is true or false. Copy and complete the following table.

Statement	True or false?
A correlation has an independent and dependent variable.	
A coefficient is the outcome of the test for relationship.	
A positive correlation is when both variables increase.	
A coefficient of 0.001 is a strong correlation between variables.	
Correlation data is presented on a bar graph.	
If a significant Spearman's rank test statistic is found the null hypothesis should be accepted.	
A Spearman's rank test is used on ordinal data.	

#### SKILLS

ANALYSIS, EVALUATION

#### EXAM PRACTICE

1. Describe the procedure of your practical investigation in biological psychology. (4 marks)
2. Explain whether the findings of your practical investigation were statistically significant. (2 marks)
3. Explain one improvement that could be made to the validity of your practical investigation in biological psychology. (2 marks)

#### EXAM TIP

Your practical investigation is like any other classic or contemporary study you have learned, so you need to know the aims, procedure, results, conclusions and improvements in addition to strengths and weaknesses. You could be asked to write an essay evaluating your practical investigation, so this should be prepared in the same way as preparing for evaluating a classic or contemporary study.



A close-up photograph of a baby with light brown hair and bright blue eyes, wearing a white t-shirt. The baby is holding a horizontal wooden bar with both hands, looking directly at the camera with a slight smile. The background is a plain, light-colored wall.

# TOPIC D LEARNING THEORIES AND DEVELOPMENT

Learning can be defined as a process that leads to relatively stable behaviour change. When we learn, we change the way we interpret information and ultimately the way we interact or behave. Learning theories are associated with the behaviourist approach and the work of pioneering psychologists such as John B. Watson (1878–1958), B.F. Skinner (1904–1990) and Albert Bandura (1925–2021) who believed that the focus of psychology should be on observable behaviours, because internal moods or thoughts are too subjective and untestable. This approach dominated early 20th-century psychological research.

Learning theory emphasises ‘nurture’ and understanding how behaviour is shaped by the environment around us, rather than biological mechanisms within us (nature). By noting how behaviour is shaped by environment rather than biology, such theorists emphasise the way in which a human baby is effectively *tabula rasa*, meaning ‘a blank slate’, which external forces can then shape and mould accordingly. In this topic we will explore three different theories which explain how we learn new behaviours through association, consequence and observation.





# CHAPTER 20 CLASSICAL AND OPERANT CONDITIONING AND SOCIAL LEARNING THEORY

## LEARNING OBJECTIVES

By the end of this chapter, you should be able to:

- describe and evaluate classical (Pavlovian) conditioning as a theory of learning, including its main principles
- describe and evaluate operant conditioning as a theory of learning, including Skinner's superstitious pigeon research
- describe and evaluate social learning theory, including its main principles.

## GETTING STARTED

We acquire many behaviours through classical conditioning without even realising it. One such behaviour could be a fear of an object. Classical conditioning explains that if we have a frightening experience when an object is present, we may associate fear with that object. The next time we encounter the object we will show fear. Here is a list of commonly feared animals. In pairs, discuss a situation which may have occurred which could result in a fear of each animal:

- spider
- snake
- dog
- horse.

## KEY TERMS

**conditioned response (CR):** a behaviour that is shown in response to a learned stimulus

**conditioned stimulus (CS):** a stimulus that has been associated with an unconditioned stimulus so that it now produces the same response

**neutral stimulus (NS):** an environmental stimulus that does not of itself (without association) produce a response

**unconditioned response (UCR):** a response that occurs naturally without any form of learning (a reflex action)

**unconditioned stimulus (UCS):** any stimulus producing a natural, unlearned response

## CLASSICAL CONDITIONING

Classical conditioning is learning by association. When we pair a new stimulus with an existing stimulus-response link or reflex, we learn to associate the two stimuli and respond in a similar manner to both. For example, if you visited a restaurant and the food made you ill, you may associate the restaurant with feeling nauseous.

Classical conditioning takes place when a **neutral stimulus (NS)** is paired with an unconditioned (unlearned) stimulus. Once they are paired/associated, the neutral stimulus will elicit the same response as the **unconditioned stimulus (UCS)**.

We think of classical conditioning as occurring in three distinct stages:

- Before conditioning: a neutral stimulus elicits no response. The unconditioned stimulus elicits an **unconditioned response (UCR)**.
- During conditioning: a neutral stimulus is paired with an unconditioned stimulus. This elicits an unconditioned response because the unconditioned stimulus is present.
- After conditioning: the neutral stimulus alone elicits the same response as the unconditioned stimulus, so it is renamed as a **conditioned stimulus (CS)** which elicits the **conditioned response (CR)**.

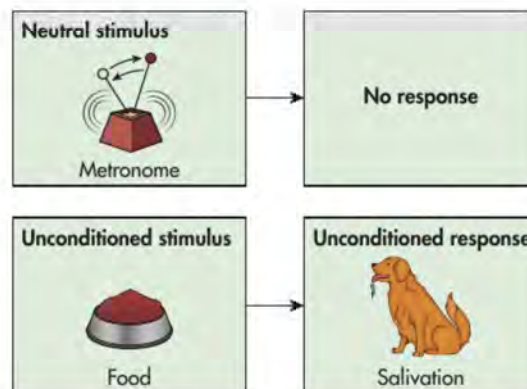
This process was discovered by Ivan Petrovich Pavlov, a Russian physiologist, and winner of the Nobel Prize in Physiology or Medicine in 1904. Pavlov had a principal interest in studying digestive processes, yet he also made what could be described as one of the most profound contributions to psychology, specifically to learning by association and classical conditioning theory. His landmark discovery came as a result of his experiment with salivation in dogs.



Pavlov found that when a dog encounters the stimulus of food, saliva starts to pour from the salivary glands. Saliva is required to make food easier to swallow and also contains enzymes to break down certain compounds in the food. While carrying out his experiments, Pavlov became involved in studying reflex reactions as he observed that the dogs drooled and produced saliva without the proper stimulus. Pavlov hypothesised that the dogs were reacting to the lab coats of his assistants. Each time the dogs were presented with food, the assistant presenting the food was wearing a lab coat. In essence, the dogs were responding as if food was on its way in the presence of a person wearing a lab coat.

In a sequence of experiments, Pavlov then tried to establish how the two phenomena were linked. Pavlov created a soundproofed lab to see if the presentation of precise stimuli would evoke a response in conditions that ensured no direct contact between the dogs and experimenter. Pavlov knew that food (UCS) would lead to salivation in the mouth of an animal (UCR). Pavlov then used a neutral stimulus – an item that in itself would not elicit a response – for example a metronome. Over several learning trials the dog was presented with the ticking of the metronome immediately before the food appeared. If the metronome was ticking in close association with their meal, the dogs learned to associate the sound of the metronome with food. After a while, just at the sound of the metronome, they responded by drooling. Pavlov concluded that environmental stimuli that previously had no relation to a reflex action, for example the sounding of a metronome, could, through repeated pairings, trigger a salivation reflex and that through the process of associative learning (conditioning) the conditioned stimulus leads to a conditioned response.

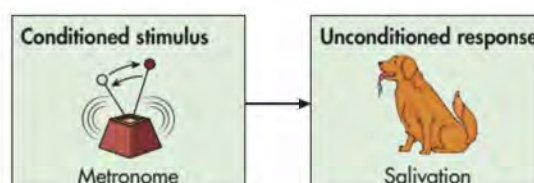
This process can be best understood by looking at the three conditioning stages (Figures 20.1–20.3).



► Figure 20.1 Before conditioning there is no link between the stimulus and the response



► Figure 20.2 During conditioning the stimulus becomes linked to the response



► Figure 20.3 After conditioning the stimulus causes the response. In this case the dog salivates when it hears the metronome



**EXAM TIP**

When answering an examination question about classical conditioning, remember that the neutral stimulus becomes the conditioned stimulus, and the unconditioned response becomes the conditioned response. This will help you check your answer.

Having identified the existence of this associative learning, Pavlov wished to establish the reliability of his findings. He set out to see if the same system of learning would work with neutral stimuli, for example the presentation of a vanilla odour, and a visual test involving a rotating disc being seen prior to food being given. Pavlov went on to pair a further neutral stimulus with the conditioned stimulus, for example, a shape or colour (CS2) with the sound of a metronome (CS1) and found that higher order conditioning was possible. He also found that dogs showed stimulus generalisation to sounds of a similar tone but were able to discriminate between sounds that were of a quite different tone. The more similarity there was between a new neutral stimulus and the conditioned stimulus, the greater the amount of drooling from the dog.

**THINKING LIKE A PSYCHOLOGIST**

Being scared of going to the dentist is a common fear. How would you explain this fear using the principles of classical conditioning? How would you go about removing a fear of the dentist?

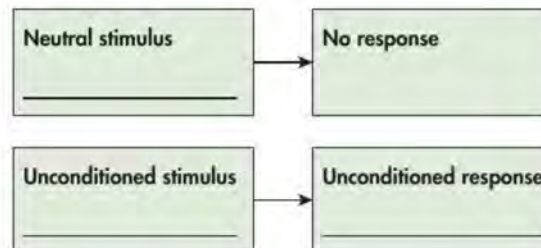
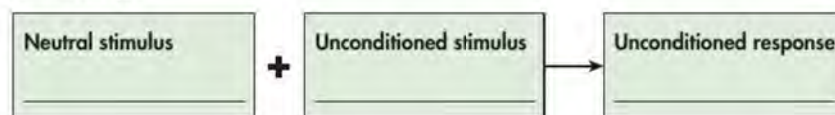
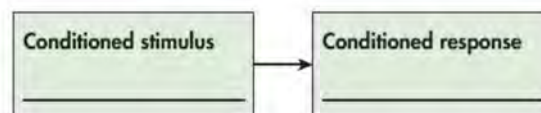
Pets learn to associate the sound of their food being opened with their food. This explains why they come when they hear their food being opened





**SKILLS**INTERPRETATION,  
PROBLEM-SOLVING**ACTIVITY 1**

Copy and complete this conditioning diagram to explain the following scenarios:

**Before conditioning:****During conditioning:****After conditioning:**

1. At home, whenever someone turns on the cold tap in the kitchen sink, your shower becomes very hot, causing you to jump out of the way of the very hot water. As this continues over time, you begin to jump back to avoid the very hot water whenever you hear the kitchen tap turning on.
2. You are a very young infant. Your family take you to the laboratory where they work. An experimenter shows you a white mouse before sounding a loud startling noise. This continues. You start to become scared at the sight of any white mouse.
3. On the bus home from college, a mobile phone rings. You reach for your phone in your bag, even though the sound is coming from further up the bus.

**STIMULUS GENERALISATION AND DISCRIMINATION**

Stimulus generalisation is the tendency to produce the same response to a stimulus which is similar to the conditioned stimulus. For example, you may be fearful of spiders, but also show the same fear response to other insects that look similar to spiders.

Stimulus discrimination means that a conditioned response only occurs in response to a specific conditioned stimulus and not to other stimuli, because other stimuli are sufficiently different from the conditioned stimulus to not produce a response. For example, you may be fearful of moths, but not other flying insects.

The ability to generalise and discriminate between stimuli has important evolutionary implications. If our ancestors ate red berries while foraging and this made them seriously ill, they may have thought twice before eating some purple berries. Although the berries are slightly different, they are also similar and could therefore cause the same negative consequences. Such cautious behaviour would have helped to ensure their survival. Similarly, discrimination may also have proved useful to our ancestors' survival. If they took the risk of eating the purple berries and they produced no negative consequences, they would be able to make a similar distinction in future and provide the hunter-gatherers with another valuable food source, so enhancing their own survival.



## EXTINCTION AND SPONTANEOUS RECOVERY

As the word extinction suggests, this is the removal (death) of a behaviour. Pavlov showed that if the metronome (CS) is continually presented without any food (UCS) being paired with it, the dog will gradually learn to disassociate the two stimuli so will not salivate at the metronome. However, this association may not be entirely lost. If the metronome is once again paired with the food following extinction, the dog will quickly learn to associate the food with the metronome and will salivate at the metronome alone once more. This accelerated form of learning is known as spontaneous recovery and means that extinction is not the same thing as 'unlearning'. While the response may disappear, it has certainly not been eradicated.

## EVALUATION OF CLASSICAL CONDITIONING

Pavlov's experiments with dogs are evidence for classical conditioning as an explanation of how animals acquire behaviour. While we should be cautious when using animal research to explain human behaviour, a similar outcome was achieved with a human child. John Watson and Rosalie Rayner (1920) conditioned a small boy, Little Albert, to be scared of a white rat using the principles of classical conditioning. This offers experimental support for classical conditioning as an explanation for how we acquire behaviour in humans. However, Little Albert was described as a particularly unemotional child, so the way in which he was conditioned to fear a white rat may not be the same as for other children.

Classical conditioning can explain a range of behaviours, notably phobias. A phobia is an irrational fear of an object or situation which can develop because we have associated the object with feeling scared. This knowledge has led to the development of treatments, such as flooding and **systematic desensitisation**.

### LINK

This classic study will be discussed further on pages 271–275.

### KEY TERMS

**desensitisation:** brought about by relaxation techniques taught before facing the phobic object

**systematic:** gradually facing up to the phobic object via a hierarchy of exposure (from least fearful to most fearful)

### LINK

Systemic desensitisation is explained on pages 250–252. Juan Capafons et al. (1998) found that systematic desensitisation did reduce a fear of flying, showing that classical conditioning can explain some human behaviours. This contemporary study will be discussed further on pages 275–278.

Another strength of classical conditioning as an explanation of how we learn behaviours is that it has been used to treat people with addictions who learn to associate their addictive behaviour with something unpleasant. Aversion therapy has been used to treat a range of addictions and maladaptive behaviours by associating doing the undesirable behaviour with an aversive stimulus, such as an electric shock or a drug that makes you feel nauseous.

## WIDER ISSUES AND DEBATES

### Social control and ethics

Aversion therapy has a controversial history of use on behaviours which were considered undesirable at the time. It is argued that it was used as a form of social control to remove behaviour viewed as undesirable by others. It also has significant ethical implications because the aversive stimuli is unpleasant or even harmful.

A weakness of classical conditioning is that it can only explain how we acquire a narrow range of behaviours based on reflexive or involuntary responses. We can learn to associate different stimuli with a limited number of reflex responses, but it cannot explain how we generate new voluntary responses. In this chapter we will explore different theories of learning which better explain how we acquire complex novel behaviours. Furthermore, classical conditioning only explains learned responses, so fails to address the cognitive processes involved in learning. Complex forms of behaviour can be explained by decision-making and problem-solving. It also



fails to account for the biological factors, such as genetics and neurotransmitters, which are responsible for influencing some behaviours.

### WIDER ISSUES AND DEBATES

#### Classical conditioning and the nature–nurture debate

Classical conditioning explains that behaviour is acquired through experiences we have, so is regarded as a nurture explanation. This suggests that all behaviour is learned, which ignores the role of nature. Some behaviours are influenced by biological/innate factors, such as being predisposed to being aggressive or sporty. Adopting an exclusively 'nurture approach' fails to account for factors from nature that influence behaviour.

## OPERANT CONDITIONING

### KEY TERMS

**consequence:** an outcome of something. In this topic, a consequence is something that follows the showing of a behaviour

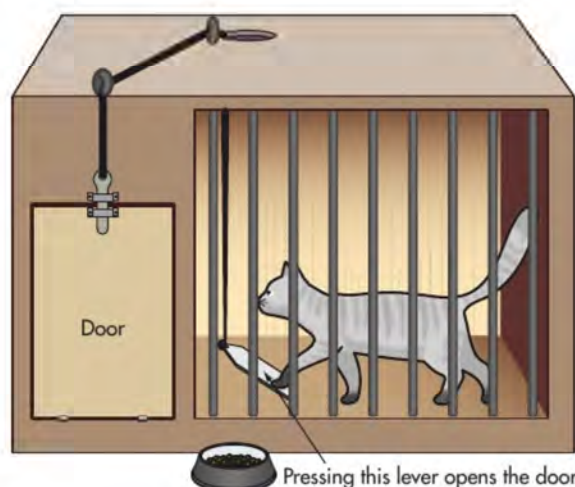
**instrumental learning:** the term Edward Thorndike originally gave to the form of learning where the consequence of a behaviour dictates the further repeating of it

**law of effect:** created by Thorndike, suggesting that behaviour with a nice consequence following it will lead to replication of behaviour. Behaviour with an unpleasant consequence following it will lead to it being withdrawn

Operant conditioning involves learning through **consequence**. Through operant conditioning, an association is made between a behaviour and a consequence for that behaviour. Put simply, if we get punished for a particular behaviour, according to the theory it is likely that we will not repeat that behaviour in future. However, if we show a behaviour that is followed by a positive experience – maybe praise or some physical reward – it is likely that this behaviour will be repeated.

For example, when a laboratory pigeon taps a blue button with its beak, it receives a food pellet as a reward. However, when the pigeon taps a red button it receives a mild electric shock. As a result of learning these consequences, the pigeon learns to press the blue button but avoid the red button in future.

It was Edward Thorndike (1911) who originally labelled this form of learning **instrumental learning**. His research involved what he called the puzzle box (See Figure 20.4). This was a box, in which he placed a kitten; the kitten had to solve a puzzle in order to escape the box to receive a food reward. Initially, he observed that the kitten would climb everywhere around the box – quite randomly – and accidentally hit the latch to open the door. Once the kitten opened the door it was given food. However, after several learning trials the kitten escaped faster. So, the kitten had learned by trial and error (not by insight) that finding and opening the latch to get out meant it was rewarded by food. Thorndike termed this the **law of effect** stating that a response followed by a pleasant consequence, for example being rewarded, tends to be repeated while one followed by an unpleasant consequence, for example punishment, tends not to be repeated. Moreover, according to Thorndike's law of effect, all things being equal, the more often a response is performed in a given situation, the more likely it is to be repeated.



► Figure 20.4 Thorndike used a puzzle box to train a cat to escape

Burrhus Skinner renamed instrumental learning as operant conditioning. Skinner took a scientific approach and felt that he could not study something that was not directly observable, such as the mind. He believed that to understand human behaviour, it was necessary to apply scientific principles and methods. He felt the description operant conditioning was more appropriate as with this form of learning you are 'operating' on or being influenced by the environment.

Skinner started his research in the 1930s, using lab experimentation with



**KEY TERM**

**ABC model of operant conditioning:** a way of explaining how operant conditioning works, showing how the consequence of a behaviour influences the replication of behaviour

his 'Skinner Box' (see Figure 20.5) which was essentially a box that could dispense food and electric shocks to animals such as rats or pigeons. Skinner created the **ABC model of operant conditioning** to explain how learning works:

- **Antecedent:** the Skinner box would present a stimulus (lights/noise) that triggers a behaviour
- **Behaviour:** a response made by the animal that can be observed (measured) as an outcome of the antecedent
- **Consequence:** the reward/punishment following the behaviour (shock/food).

**TYPES OF REINFORCEMENT AND PUNISHMENT**

The work of Thorndike and Skinner show us that a stimulus–response association can be encouraged so the behaviour is repeated. This is known as reinforcement. It also shows us that a behaviour can be discouraged through punishment. There are different types of reinforcement and punishment.

**Positive and negative reinforcement**

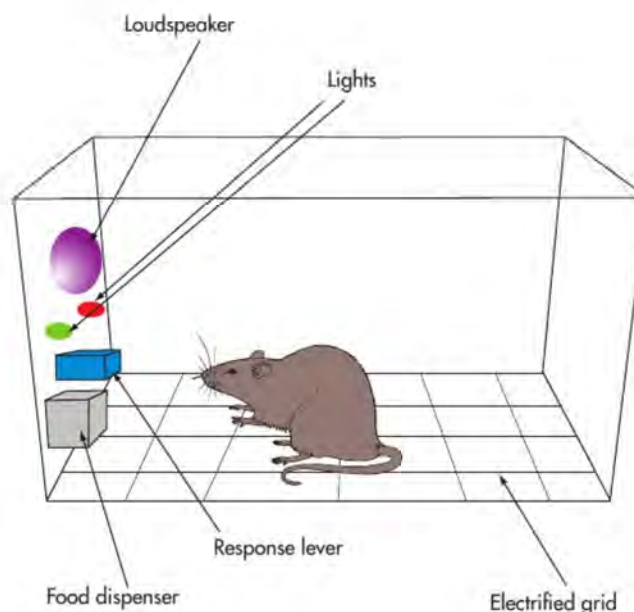
If a rat or pigeon is given something pleasurable like a food pellet following a desired behaviour, for example lever pressing, they are more likely to repeat this behaviour in future. This is known as positive reinforcement. On the other hand, negative reinforcement is the removal of something unpleasant in response to the desired behaviour. This will also increase the likelihood of the behaviour being repeated, in order to avoid the unpleasant stimulus. Therefore, if a rat or a pigeon is given an electric shock until a lever is pressed, they are more likely to press the lever again to avoid electric shocks in future.

Both positive and negative reinforcement produce repeated behaviour.

**Positive and negative punishment**

Punishment weakens a behaviour by presenting something unpleasant or painful whenever the behaviour is shown. Therefore, if a rat presses a lever and is given an electric shock, it will stop pressing the lever to make sure it does not get another electric shock in future. Like reinforcement, punishment can be both positive and negative.

- **Positive punishment (P+)** is adding an aversive stimulus that will reduce the showing of a behaviour. For example, a child behaves badly at a party. The parents may scold the child. This reduces the appearance of a behaviour by presenting an unpleasant stimulus (scolding) when the behaviour occurs.



► Figure 20.5 A Skinner box



- **Negative punishment (P–)** is the removal of a liked/desirable stimuli to reduce the appearance of a behaviour. For example, the child at the party behaves badly and has their favourite toy taken away as a result. The removal of a desirable stimulus will reduce the frequency of the child's bad behaviour.

Punishment is not considered an effective way of learning because it often only results in a temporary suppression of undesirable behaviour and only teaches you what you should not do. Reinforcement is a better form of learning as it teaches you what to do. Furthermore, punishment can be humiliating and create anxiety and fear.

### EXAM TIP

It is important to notice how the words 'positive' and 'negative' are used in this context. They have a particular meaning. These are used in the mathematical sense – of adding to or taking away. So punishment and reinforcement can be both negative and positive in terms of the stimulus provided (good things can be added or taken away).

Working out which type of reinforcement or punishment is being used can be tricky. When answering an examination question on types of reinforcement and punishment, work out whether the behaviour is likely to be repeated again; if it is repeated then it has been reinforced, if it is not repeated it has been punished. Next, consider whether the individual has received something for their behaviour or had something taken away. If they have received something then it is positive; if they have had something taken away it is negative.

### SKILLS

CRITICAL THINKING, ANALYSIS

### ACTIVITY 2

Which of the following examples are positive reinforcement, negative reinforcement, positive punishment or negative punishment?

1. Always using sunscreen to prevent getting sunburn
2. Being told off because you have left your bedroom in a mess
3. Getting a merit for producing a good essay, so you work hard on the next essay
4. Getting a detention for not handing in your homework on time
5. Not being allowed out with your friends because you have behaved badly
6. Getting a treat for helping around the house
7. Driving at the speed limit to avoid getting a speeding ticket.

### WIDER ISSUES AND DEBATES

#### Practical issues in the design and implementation of research

Psychologists like Pavlov and Skinner chose to study animals for a number of reasons. Undoubtedly, humans and animals share many biological characteristics, which allow researchers to draw conclusions from one species to another. Moreover, animals allow researchers a higher degree of experimental control and objectivity compared to human participants. Indeed, Pavlov's and Skinner's experiments, which were generalised to humans, have made a huge contribution to the understanding of human behaviour. Others, however, criticise animal research for its lack of generalisability, suggesting that extrapolating from one species to another is problematic. In biological terms, evolution has created very specific demands for each species and, with it, its own set of unique behaviours. There are also significant brain differences between humans and non-human animals. Validity is also an issue given that animals are studied in an artificial laboratory setting. Researchers need to be aware of such issues when looking to extend the results gained from animal studies to humans.



### THINKING LIKE A PSYCHOLOGIST

Dog training is often based on the principles of operant conditioning. Using the different types of reinforcement and punishment, consider how you might go about training a dog for police search and rescue.

### TYPES OF REINFORCER

When reinforcing a behaviour it is important to use a stimulus that will encourage a behaviour to be repeated. In operant conditioning there are two types of reinforcer that increase the likelihood of a behaviour being learned. Primary reinforcers occur naturally and satisfy basic human needs such as food, water and shelter. Secondary reinforcers, on the other hand, only strengthen the behaviour because they are associated with a primary reinforcer, for example money can be used to buy food, accommodation, clothing and so on. Secondary reinforcers have no intrinsic value themselves but can be exchanged for a primary reinforcer which has.

A **token economy** system is based on the principles of operant conditioning. It has the aim of trying to encourage desirable behaviour through a system of reward. The tokens used in such a system are secondary reinforcers as it is these that will be exchangeable for primary reinforcers. The tokens are only given in return for showing the desired behaviour. The more tokens saved, the better the reward; therefore through selective reinforcement, desirable behaviours. Token economies have been implemented in institutions such as schools and prisons. For example, students may be allocated tokens for good behaviour, such as good attendance, punctuality or high test scores. These can then be exchanged for items in the school shop or perhaps a school trip.

#### KEY TERM

**token economy:** a treatment method that provides secondary reinforcement for a desirable behaviour that can be saved up or exchanged for a primary reinforcer

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
I will Brush my teeth	★ ★ ★		★ ★				
I will Eat all my food		★ ★					
I will Go to bed on time	★	★	★				
I will Brush my hair	★ ★		★				
I will Finish my homework			★ ★				
I will Finish my reading	★	★ ★					
I will Be good today	★ ★		★				
I will Eat my vegetables		★ ★	★				
I will Do more exercise	★		★				
I will Pack my school bag	★			★			

When I get <u>14</u> Stars I will get a toy car	When I get <u>12</u> Stars I will get an ice cream	When I get <u>13</u> Stars I will get to go ice skating
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Star charts are secondary reinforcers used to encourage good effort at home



## SKILLS

REASONING/ARGUMENTATION,  
COMMUNICATION, ANALYSIS

During your study of this topic you will have opportunities to apply your knowledge to different contexts. In Paper 4 you will also be asked to use your knowledge of the topics and approaches to discuss a key question of relevance to society. You will be given a key question and some background information to help apply your knowledge of concepts, theories and research to explain the key question. You should also consider other plausible explanations and develop a 'for and against argument' for the key question you have been given.

## KEY TERMS

**continuous reinforcement:** the desired behaviour is reinforced every time it occurs

**partial reinforcement:** the desired response is only reinforced some of the time

## ACTIVITY 3

One key question in society is whether it is appropriate to use token economies to promote desirable behaviour. Token economies are used to promote desirable behaviour in many different contexts, such as schools, prisons and clinical settings. For example, Paul and Lentz (1977) investigated the effectiveness of reinforcing appropriate behaviour with 84 schizophrenic patients. Patients were given tokens as rewards when they behaved appropriately and these could be exchanged for luxury items. They found that the token economy reduced some schizophrenic symptoms, such as bizarre motor behaviours, for example rocking and blank staring, and was also successful in improving interpersonal skills and self-care skills. However, tokens were not effective in treating the cognitive symptoms of schizophrenia, such as delusions and hallucinations, nor hostile behaviour such as screaming and swearing. They found that 11 per cent of token economy patients required drug treatment, compared to 100 per cent in their control group and concluded that operant conditioning is an effective means of treating people with chronic schizophrenia.

In pairs, discuss the key question of whether it is appropriate to use token economies to promote desirable behaviour. You should use concepts, theories and/or research studied in your psychology course.

## SCHEDULES OF REINFORCEMENT

A schedule of reinforcement determines the time in which a behaviour will be reinforced. In some situations a behaviour might be reinforced every time it is seen (**continuous reinforcement**), although more realistically in the context of day-to-day life, a behaviour might be reinforced some of the time (**partial reinforcement**). If Skinner had continuously reinforced the rats with food each time they pressed the lever, after a short while the rats would become satiated and the motivation to press the lever would fall. Using a partial schedule of reinforcement Skinner found that the rats continued to press the lever. Interestingly, a behaviour that is acquired through partial reinforcement might take longer to learn, but is more resistant to extinction.

The four schedules of partial reinforcement are:

1. Fixed interval – the rewarding of a correct response only after a preset amount of time has passed. For example, a rat in the Skinner box receives a food pellet every ten seconds if the rat has pressed the lever at least once during that time. Learning takes longer, but the response rate of the animal is higher towards the end of the learning.
2. Variable interval – the rewarding of a correct response after a set amount of time has passed; after which a new time period is set. For example, a rat in the Skinner box receives a food pellet after five seconds if they have pressed the lever at least once during that time, and then receives a food pellet after ten seconds if they have pressed the lever during that time. Each time the interval between receiving a food pellet changes.
3. Fixed ratio – where a response is reinforced only after a specified number of responses has been shown, for example providing a food pellet to a rat after it presses a lever eight times.
4. Variable ratio – a response may be reinforced after a set number of correct responses is given. After this has been achieved, the number of correct responses in order for reinforcement to be given changes. Skinner might give a food pellet after three lever presses, and then after five lever presses. The number of lever presses required to get food is different each time. Skinner argued that this form of schedule is good for maintaining behaviour because the food being dispensed is contingent upon pressing the lever a certain number of times, but the rat cannot anticipate when the food will arrive. This also results in the extinction rate for a behaviour being low.



## SKILLS

INTELLECTUAL INTEREST AND  
CURIOSITY, SELF-REGULATION

## ACTIVITY 4

Schedules of reinforcement are all around us: getting a treat each week we do household chores, being paid monthly by an employer, receiving a free drink if we collect a certain number of points at a café. In pairs, think of other ways in which our behaviour is reinforced using continuous and partial schedule of reinforcement.

## EVALUATION OF OPERANT CONDITIONING

Operant conditioning as an explanation of how we acquire behaviour is supported by highly controlled animal experiments. The rats and pigeons Skinner tested were observed in isolated boxes and cages to eliminate any other variables that could affect their behaviour other than the stimulus (food) being tested. This ensured that a cause-and-effect relationship could be made between the reinforcement and punishment given and the resulting behaviour. Photographs and videos were taken of the animals and their behaviours were precisely recorded by other observers. As only observable behaviour is measured, it could be argued that this is an objective measure. Moreover, such experiments can be replicated, allowing for reliability to be assessed. However, this controlled environment is not a natural way to observe behaviour. The contrived and artificial nature of such experiments questions the ecological validity of the findings and the extent they can be applied to real-life settings. However, we should be cautious when drawing conclusions from animal research of this nature. While animals may use trial and error to work their way out of a puzzle box, humans are more likely to problem-solve to escape.

Operant conditioning is used in many everyday contexts, so has real-life applications. The token economy has been used in psychiatry, clinical psychology and education using patterns of reward to shape behaviour. Some token economies may take tokens away as punishment for undesirable behaviour, such as aggression. Ayllon and Milan (1979) reviewed a number of such programmes and found that they were successful for promoting certain behaviours, for example keeping rules and control over aggression. Research suggests, however, that the benefits of token economies are relatively short-lived and tend not to generalise beyond the institution itself. They are also viewed as a violation of human rights because privileges are withheld until enough tokens are earned. This raises a question over the rehabilitative value and ethics of token economies.

## WIDER ISSUES AND DEBATES

## Operant conditioning and social control

Operant conditioning can be used to modify undesirable behaviour. Behaviour modification aims to extinguish undesirable behaviour (by removing the reinforcer) and replace original behaviour with a desirable behaviour and reinforce it. Behaviour modification has been used in a variety of contexts. In parenting it can be used to encourage desired behaviour in children and to reduce undesirable behaviour. For example, a parent might praise a child for tidying their room or sharing their toys, or might reduce television time for fighting with siblings.

Using knowledge of operant conditioning can be viewed as helping support skill-building and improve well-being, however it could also be viewed as a form of social control used to manipulate desired behaviour. However, rewards and sanctions are a part of everyday life, and many would argue they are necessary for society to function. Skinner described a utopian society where its citizens' behaviour was managed using operant conditioning in his fictional publication *Walden Two*. However, behavioural engineering may be used to restrict individual autonomy and freedom of choice which could violate civil liberty.



**WIDER ISSUES AND DEBATES****Skinner and reductionism**

Learning theorists such as Skinner are happy to explain all behaviour as an outcome of previous learning. He, like other learning theorists, would argue that we are organisms that behave the way we do due to the sum of our experiences. This is known as reductionism. However, this approach ignores other influences on our behaviour, such as innate/biological factors, including genetic differences and instincts, on behaviour. It could be said that Skinner's observations only account for observable behaviours and do not account for any unobservable behaviours, for example mental and emotional states such as anger or happiness, making his explanations limited and oversimplified.

A major strength of operant conditioning is that it can explain a wide assortment of behaviours, from addiction to language acquisition. Skinner would argue that a child's correct utterances are positively reinforced. For instance, a child says 'juice' and the parent smiles and gives the child some juice as a result. Obviously, the child will find the outcome of saying this word rewarding and this in turn will aid the child's language development.

However, the use of laboratory experiments with animals in classical and operant conditioning raises a number of ethical issues. It could be argued that Skinner's research, for instance, caused unnecessary suffering to the rats and pigeons in his experiments because they needed to be starved to around 75 per cent of their normal weight to be sufficiently motivated to perform. This needs to be weighed against the benefits of the research and whether or not the ends justify the means. Others may argue that the research was justified as it furthered our understanding of behaviour.

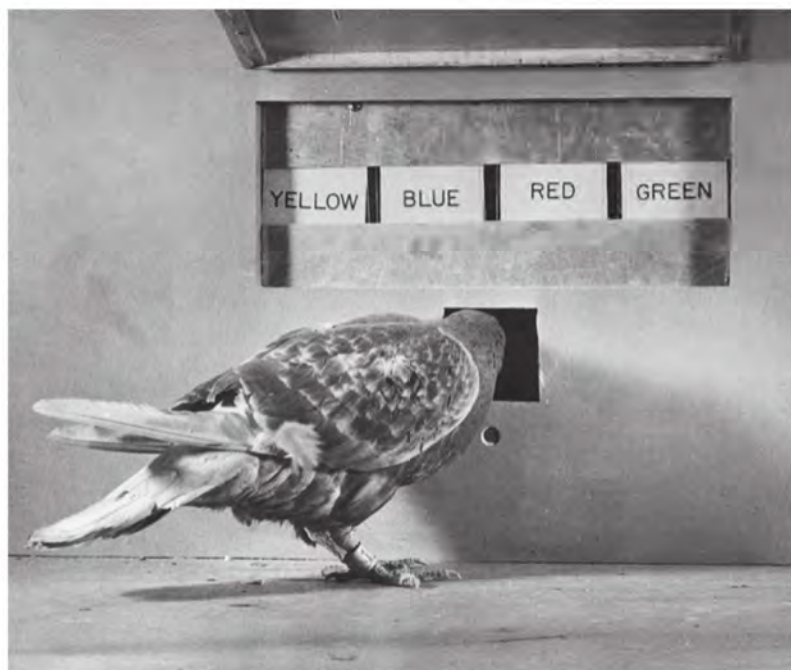
**SKINNER (1948) SUPERSTITION IN THE PIGEON**

Skinner devised a series of experiments using pigeons to test what would happen if the pigeon was reinforced with food without any desired behaviour being required. Placed in a cage for a few minutes a day, the hungry pigeons were fed via a food hopper which appeared for five seconds. Food was presented at regular intervals regardless of how the

bird behaved. In six out of eight pigeons, clearly defined behaviour developed. One pigeon began turning counterclockwise and another thrust its head towards the corner of the cage. A third pigeon repeatedly tossed its head, and two pigeons began moving their head and body in a pendulum motion. The final pigeon developed brushing movements of its head towards the floor.

Skinner explained these behaviours as being a result of the food reinforcing the behaviour the bird displayed prior to food appearing. The bird behaves as if there is a relationship between its behaviour and the food appearing – even though there was not. This effect was more likely to occur if the food was presented in short intervals, such as every 15 seconds, because the bird could only perform a narrow range of behaviours within that time. However, once a behaviour was established, the intervals between the food appearing could be lengthened to up to two minutes.

▼ Skinner trained pigeons to engage in superstitious behaviour





These behaviours are similar to those which we develop in everyday life. If you have a mascot you take to a sporting event, it may be because you had the mascot when your team won, and it acts as reinforcement to take it again. Skinner paralleled the nature of this incidental learning with superstitious behaviour we can all develop.

### EVALUATION OF SKINNER (1948) SUPERSTITION IN THE PIGEON

Criticisms of Skinner's research include that he used a small number of pigeons to conduct his experiment, with six out of eight pigeons demonstrating superstitious behaviour. Furthermore, pigeons are unlike humans because humans are more likely to use rational thinking when choosing to behave in response to reinforcement. Therefore, it may be unwise to generalise these findings to explain how humans develop superstitious behaviours.

The research was highly controlled and followed a standardised procedure with specific timings, such as the food appearing in specific intervals (five seconds, 15 seconds and two-minute intervals) before disappearing. In this way the behaviour of pigeons could be directly measured in different conditions, and we can be sure that the presentation of the food related directly to their behaviour. Furthermore, two observers had perfect agreement when counting the number and types of behaviours shown by the pigeons, which gives inter-rater reliability.

There are also ethical issues with this research. Pigeons are living vertebrate animals which are protected by legislation in many countries which regulates possible harm caused when conducting research using animals. The pigeons were starved to 75 per cent of their healthy body weight, which may be deemed unethical. However, Skinner minimised the number of pigeons used to just eight to ensure any harm was limited.

### SOCIAL LEARNING THEORY

#### KEY TERM

**role models:** significant individuals in a person's life. You are more likely to imitate role models such as parents or teachers

▼ Children see their parents as role models so are more likely to model their behaviour



Social learning theory differs from the principles of learning already examined earlier in this topic. For social learning theory, behaviour is explained not by the simple association between a stimulus and response (classical conditioning); nor is it explained by how a consequence of an action can dictate if a behaviour is shown again (operant conditioning). Rather, social learning theory is learning through observation. This involves being able to pay attention to and remember what someone is doing in order to copy them. This means that social learning theory does not ignore the role of cognition like classical and operant conditioning theories.

Social learning theory is largely attributed to the work of Albert Bandura. Proponents of the approach believe that humans and animals learn by observing the others around them and subsequently imitating or copying the behaviour. Individuals that are observed are called

models. Models demonstrate a behaviour in the presence of another person, which is known as modelling. Children are surrounded by many **role models**, such as parents, peers, teachers and television characters. On a daily basis, these models provide examples of behaviour to the children to observe and imitate.

Behaviour is more likely to be imitated if the observer can identify with the role model and the observed behaviour is reinforced in some way. Effective role models are typically the same sex as the observer and/or can be admired for having status/power. Similarly, an observer is more likely to reproduce the model's behaviour if the consequences are rewarding rather than resulting in punishment for the role model. For example, if a younger sibling is watching their



**KEY TERM**

**vicarious reinforcement:** learning through the consequence of another person's behaviour

older sibling eat their lunch and they get praised for not making a mess, they are more likely to copy this behaviour. They are unlikely to copy eating behaviour that has previously been punished, for example an older sibling eating their lunch with their mouth open. This process is known as **vicarious reinforcement** and vicarious punishment and essentially means learning from the successes or mistakes of others.



Older siblings can act as role models for younger siblings ▶

**SOCIAL LEARNING 'STAGES'**

Bandura theorised that social learning would only occur if the following four cognitive processes occurred: attention, retention, reproduction and motivation.

**Attention**

Bandura argued that one of the required conditions for effective learning was 'attention'. This illustrates a clear cognitive element to his theory, and one that could result in behaviour being copied or not. Attention must be paid to the role model or else learning will not take place. Attention could depend on many factors such as the distinctiveness of the behaviour being modelled and also factors within the person observing a model, such as their level of arousal. Bandura proposed that a child is more likely to attend to role models who are similar to themselves and so are more likely to attend to the behaviour of people of the same sex.

**Retention**

Having focused on the modelled behaviour the individual must then retain or store what they have attended to. Humans store the behaviours they observe and are then able to recall these later when reproducing the behaviour. This is a cognitive process which relies upon memory.

**Reproduction**

Reproduction involves **imitation** of the modelled behaviour – the reproduction of what has been observed. Again, here Bandura made it clear that factors such as the physical capabilities of the individual can affect whether the behaviour can be imitated. If the behaviour is beyond our capabilities, then it cannot be reproduced.

**KEY TERM**

**imitation:** copying a behaviour that has been observed and remembered



### Motivation

The final process refers to the 'incentive'. If a reward is offered, we are more likely to reproduce the behaviour. Intrinsic motivation refers to the doing of an activity where there might be inherent satisfaction rather than some physical outcome. For example, a young boy imitates his dad's behaviour. The young person 'feels good' about his copied behaviour because he feels it makes him more like his dad.

Extrinsic motivation refers to a motivator that is not so much a feeling or view, but rather something tangible, something that has a separable outcome, for example a sportsperson receiving a trophy or medal for their performance.

Vicarious reinforcement is a form of motivation that does not directly reward the individual; instead it is when the role model is seen to receive a reward. In its simplest form this could involve, for example, a child witnessing another child showing a good behaviour and receiving praise. Notice here the observing child does not get a reward themselves – the reward is vicarious. But the observing child thinks 'If I act like that, I could get a reward too!'

### EVALUATION OF SOCIAL LEARNING THEORY

As with other learning theories, a strength of social learning is its commitment to scientific research methods. The theory is based on laboratory-based research methods that ensure reliability and allow inferences about cause and effect to be made. This can also be viewed as a weakness as the studies have taken place in rather artificial settings, bringing into question the generalisability and **ecological validity** of the research. Unlike classical and operant conditioning, social learning theory does allow for individual differences and acknowledges that cognitive and motivational factors can influence behaviour as factors as reflected in the four processes suggested by Bandura – through attention, retention, reproduction and motivation.

#### KEY TERM

**ecological validity:** the ability to generalise the findings of experimental research to situations beyond the laboratory

The theory has also made a significant contribution to the psychology of aggression and gender development and has formed the basis for a range of treatments such as phobias. Modelling-based therapies, for example, can be used with children or adults, who may find behaviour therapies using direct conditioning difficult. Typically, modelling therapies involve learning through the observation and imitation of others. Having a positive role model can give individuals something to aim for, allowing them to change their behaviour in line with their role model. This role model may be the therapist or someone the individual already knows.

There is significant evidence for social learning theory from a series of experiments conducted on children attending Stanford University nursery. Bandura, Dorothea Ross and Sheila Ross (1961) found that children would imitate aggressive behaviour displayed by a same-sex adult role model. A further experiment showed that children would copy a role model modelling aggressive behaviour shown on film, and even a cartoon version (Bandura, Ross and Ross, 1963). A third experiment found that children were less likely to copy an aggressive role model who was punished; however, this was counteracted by the offer of a reward for imitating the role model (Bandura, 1965). These studies offer strong experimental support for social learning of aggression.

Social learning theory has real-life application. During the 1960s, television was becoming commonplace in households and there was concern that children would be exposed to violent and age-inappropriate content. Social learning theory and Bandura's research informs us that children may learn from watching behaviour on the television, so they should be protected with censorship regulations, such as age certification and pin-protected viewing.

There is also biological evidence for observational learning. Andreas Olsson and Elizabeth Phelps (2007) showed 11 participants a short film clip of someone receiving a mild electric shock when a coloured square appeared. Using an fMRI brain scan, they showed that the





▲ Chickens have a pecking order

### KEY TERM

**prosocial media:** media that encourages helpful or appropriate behaviour

### LINK

Prot et al. (2014) is discussed on pages 279–282.

### SKILLS

#### CRITICAL THINKING, ANALYSIS

amygdala was more active when witnessing the film and when they were shown the same coloured square and expecting to receive the same shock. This gives biological evidence that participants had learned to fear the shock that they had witnessed.

There is also evidence for social learning among animals. Susan Mineka and Michael Cook (1988) observed rhesus monkeys raised in captivity, who originally showed no fear of snakes but did show alarm after watching the modelling of anxious reactions of wild monkeys in the presence of snakes. Furthermore, Christine Nicol and Stuart Pope (1999) taught dominant and subordinate chickens in a flock to peck at a key for food. The chickens were then released back into their flock. They found that chickens were more likely to copy key-pecking from a dominant member of the flock than a subordinate chicken. This offers support for the imitation of role models.

In a large-scale study of media use across seven different countries, Sara Prot et al. (2014) found a positive correlation between **prosocial media** use and prosocial behaviour. It could be suggested that people who engage with prosocial media are more likely to imitate prosocial behaviour.

However, Tony Charlton (2000) conducted a natural experiment to observe the behaviour of children on the remote island of Saint Helena before and after the introduction of television. He was particularly interested to see whether children learned aggressive behaviour from watching television. He found that there was no change in the children's behaviour, which questions the credibility of social learning theory because the children did not imitate role models on television.

### CHECKPOINT

1. Identify which example links to each key term relating to classical conditioning.

stimulus generalisation

stimulus discrimination

extinction

spontaneous recovery

- a) A cat owner repeatedly opened the food cupboard door but did not feed their cat. The cat eventually stopped coming over when the cupboard door was opened.
  - b) A child became scared when a large red balloon popped next to them. At her birthday party she was scared of the pink and purple balloons.
  - c) Sira was scared of earthworms, but she was not scared of caterpillars or slugs.
  - d) Leonne disliked eating fish when he was younger because it had once made him ill. However, he eats fish as an adult. Leonne recently ordered fish at a restaurant and it made him ill. He no longer eats fish because it makes him feel nauseous.
2. Look at the following examples and identify whether they are positive reinforcement, negative reinforcement, positive punishment or negative punishment.
    - a) You give your parrot some sunflower seeds every time it whistles at you.
    - b) Your cat jumps on you every time you return home. You remove your attention from your cat by turning your back and not fussing over so it does not jump up again.
    - c) Your horse pulls on the reins to go home when it starts to rain.
    - d) You sound an air horn every time your horse paws the ground.



## SKILLS

CRITICAL THINKING, PROBLEM SOLVING

## EXAM PRACTICE

1. Rhea has recently started to pinch her brother. Her mother uses operant conditioning to teach Rhea not to pinch her brother. Every day that Rhea does not pinch her brother their mother gives her a star on a star chart. Once Rhea has ten stars on the star chart she can have a biscuit.
  - a) Identify the primary reinforcer that Rhea's mother uses with Rhea. (1 mark)
  - b) Rhea no longer pinches her brother, but she recently started to pinch the family pet cat. Rhea's mother took away her favourite toy for a day as a punishment. State the type of punishment that Rhea's mother used. (1 mark)
  - c) Explain why punishment did not help Rhea learn how to play nicely with the cat. (1 mark)
2. Aanya has seen her father make bread several times. Her mother always thanks Aanya's father by cooking his favourite meal after he has baked the bread. Aanya has made bread for the first time. She feels a sense of achievement and has decided to make bread for the family every week. Describe, using social learning theory, why Aanya makes her family bread. (4 marks)
3. Evaluate classical conditioning as an explanation for human behaviour. (8 marks)



**CHAPTER 21****THE ROLE OF THE UNCONSCIOUS IN PERSONALITY DEVELOPMENT****LEARNING OBJECTIVES**

By the end of this chapter you should be able to:

- describe and evaluate the role of the unconscious in personality development.

**GETTING STARTED**

Have you ever had a feeling or done something which you cannot explain? You might have shouted at someone even if you were not cross with them, or felt angry without explanation. Freud tried to explain these feelings and behaviours by understanding the unconscious cause. However, we cannot access the unconscious cause directly; we must look for clues in the way people behave. Read the following descriptions. In pairs, discuss any clues that explain these particular behaviours.

1. A student failing to turn up for an exam
2. A parent not liking their teenage child's friend
3. A toddler pinching her baby brother
4. A person who refuses to see their siblings.

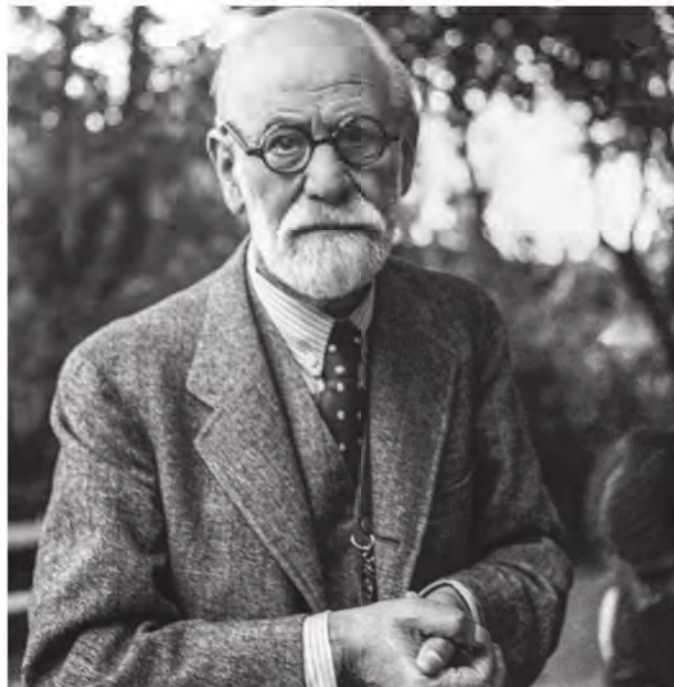
Remember, you are not looking for an obvious explanation, but a motivation that may exist in the unconscious mind.

**KEY TERM**

**hysteria:** an outdated term today, but used by Freud to describe physical symptoms without a clear medical explanation

**SIGMUND FREUD**

Freud was born in Moravia, Austria in 1856 and spent much of his life in Vienna working as a doctor. Freud mainly worked with patients with neurological disorders, but suspected that there was no biological cause for their symptoms. He started to look for psychological causes and treatments. A turning point in Freud's career came when he spent time in Paris working with Jean-Martin Charcot. Charcot was working with patients with **hysteria**, which he was able to alleviate using hypnosis. This introduced Freud to the idea that these types of disorders may be explained by the mind rather than any biological cause.



Sigmund Freud (1856–1939) ►

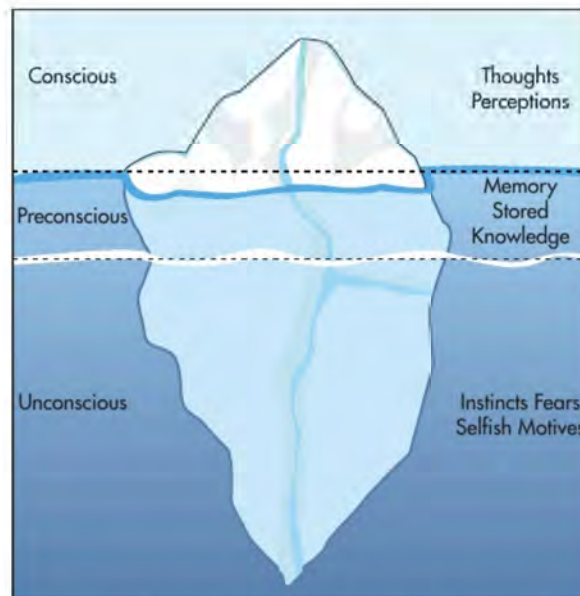


On his return to Vienna, Freud partnered with the physician Josef Breuer. Breuer had been treating a patient named Anna O who was suffering from a variety of symptoms. Breuer encouraged Anna O to talk about her symptoms which seemed to offer her some relief from them. Talking seemed to release hidden emotions which were thought to be the cause of her symptoms.

These early influences led Freud to develop his theories of mind and personality development.

### THE ROLE OF THE UNCONSCIOUS IN PERSONALITY DEVELOPMENT

Freud believed that there were three distinct levels to the human mind: the conscious, the preconscious and the unconscious. This is often pictured as an iceberg (see Figure 21.1). The conscious part of the mind contains the thoughts and perceptions that you are currently experiencing. The preconscious part of the mind contains what is not in your immediate awareness, but can be brought into conscious awareness with effort, such as stored memories. The unconscious part of mind is the largest part, containing thoughts, conflicts and desires that are not accessible to the conscious mind. Despite the unconscious being inaccessible to us, it exerts a powerful influence on our behaviour and emotions. The unconscious is influenced by primal instincts: the death instinct (Thanatos) and the life instinct (Eros). Each primal instinct motivates us. Thanatos motivates aggression and destruction, while Eros motivates creativity and preservation of life.



▲ Figure 21.1 Freud's theory of the structure of the mind can be pictured as an iceberg

### THINKING LIKE A PSYCHOLOGIST

Psychology is a science which employs scientific methods when studying behaviour. In pairs, discuss whether the concept of the unconscious can be scientifically verified. List reasons for your justification.



Freud described repression as a defence mechanism which operates by keeping threatening, harmful or unacceptable thoughts out of our conscious awareness, keeping them hidden in the unconscious mind. Repression does not diminish the intensity of these thoughts; even though we are unaware of them they exert great influence and we expend energy trying to hold them in the unconscious. Freud believed that the unconscious reveals itself through how we behave and the symbolic content of our dreams. These can be interpreted to reveal the nature of the unconscious mind.

Closely related to the concept of the unconscious is Freud's three parts of personality: the id, ego and the superego.



► Figure 21.2 The parts of our personality

- The id is the primitive part of personality which operates entirely in the unconscious mind. It contains drives and impulses and works on the pleasure principle, requiring immediate gratification of these drives and impulses.
- The ego is the rational part of personality which operates to satisfy the id's impulses in a realistic way. It operates on the reality principle because it makes rational decisions to prevent, modify or delay the id's impulses to make them more acceptable.
- The superego is the part of personality which has internalised society's morals and values. It acts as our moral conscience to guide behaviour according to what is right and wrong.

The id, ego and superego interact in a dynamic way to determine our behaviour, each having a role to play. Sometimes the demands of the id are met, and sometimes the superego is dominant. The ego tries to balance the demands of the id, reality and the superego. A weak ego can lead to impulse control issues.



Sometimes dynamics between the three parts of personality can lead to conflict which can cause internal tension. When conflict arises, the ego can use defence mechanisms to manage the tension. For example, one ego defence mechanism is displacement; this involves redirecting unacceptable impulses from one object to another which is less threatening. For example, a student receives a low grade for an essay that they have worked really hard on. The student feels angry and frustrated but cannot confront his teacher about it so they instead get into an argument with their friend. Another defence mechanism is denial, which involves blocking unacceptable thoughts from the conscious mind. For example, a student forgetting to turn up for an exam and claiming they did not know about it. These ego defence mechanisms are unconscious psychological strategies to help resolve anxiety experienced when we have internal conflict.

### SKILLS

TEAMWORK, COLLABORATION,  
CREATIVITY

### ACTIVITY 1

In a small group of three, consider the following scenario: You are at a party and you want to eat a big piece of chocolate cake before the other guests. Role play what the id, ego and superego would do in this situation:

What would the id do?

What would the ego do?

What would the superego do?

### EVALUATION OF FREUD'S THEORIES

Freud largely based his theories on clinical case studies of his own patients. One of these patients was a child named Little Hans. Little Hans had a phobia of horses, and was particularly scared of horses wearing blinkers around their eyes. Little Hans feared being bitten. He became particularly scared when seeing a horse collapse in the street. Freud interpreted Little Hans' fear of horses as the Oedipus complex. His fear of horses was actually an unconscious fear of his father. This fearfulness at seeing the horse collapse was interpreted as unconsciously wishing his father dead. While this may offer some evidence for the unconscious mind, it would be unwise to validate an entire theory mind based on one single case. Furthermore, Freud only met Little Hans on a few occasions; much of the psychoanalysis was conducted by Hans' father.

A main objection to Freud's theories is that the methods he used to gather evidence are considered unscientific. Freud interpreted his patients' and his own, behaviours and dreams to develop his theories. These are subjective interpretations about the nature of the unconscious mind and personality, so are not considered to be reliable as he may have paid attention to certain data that fitted his theories and ignored data that did not. There is also no empirical evidence for the unconscious mind, and by definition it is inaccessible to direct study. Similarly we cannot empirically test the id, ego and superego because they are psychological constructs. If we cannot test his ideas or measure his concepts, then the theory can be considered unscientific. This also means that the theories are unfalsifiable. Being able to refute (prove false) a theory is an important principle of science. Freud's theories cannot be proven or disproven.

The generalisability of his theories can also be criticised. Freud gathered data from mainly middle-class, Viennese women during the late 1800s and early 1900s, who suffered with **hysteria**. We cannot generalise a theory of human mind and personality development from such a limited sample.

However, we cannot ignore the pioneering nature of Freud's theories at the time. His theories led to treating patients differently by gaining a deeper understanding of their unique experiences rather than focusing just on their symptoms. His research and therapy has also led to the development of modern psychotherapies used to treat mental illness.

### KEY TERM

**hysteria:** an outdated term today, but used by Freud to describe physical symptoms without a clear medical explanation



**SKILLS**

INTERPRETATION, ADAPTIVE  
LEARNING

**CHECKPOINT**

1. Copy and complete the diagram below, matching the parts of the mind and personality to the correct description:

1 Conscious
2 Preconscious
3 Unconscious
4 Id
5 Ego
6 Superego

a The moral conscience
b Hidden from view
c Past memories
d The realist
e Current awareness
f The pleasure seeker

2. In Freudian terms, which part of the personality do each of the following statements describe?
- Kaia has had a very stressful test at school. On her way home she buys a really expensive jacket without considering that she doesn't have the funds to pay for it.
  - Willem has been invited to two different parties on the same evening. He really wants to go to one of the parties but instead spends less time at both parties.
  - Rhys wants to go to a party on the weekend but has an important psychology test to revise for. He decides to stay at home and revise instead of going to the party.

**SKILLS**

CRITICAL THINKING, REASONING

**EXAM PRACTICE**

- Marta is preparing a birthday meal with lots of sweet treats. She lays out the sweet treats on a table. Her younger sister and brother, Noorie and Suresh, see the sweet treats and want to eat them before the birthday meal. Marta forbids them from eating before the meal. Noorie cannot resist, and eats a handful of sweet treats in front of Marta. Suresh goes off and plays outside because he knows it would be wrong to eat any sweet treats.
  - Explain, using Freudian theory, which part of Noorie's personality was responsible for her behaviour. (2 marks)
  - Explain, using Freudian theory, which part of Suresh's personality was responsible for his behaviour. (2 marks)
  - A friend of Marta arrives with her daughter Lucy. Lucy wants the sweet treats before the birthday meal, but waits until her mother and Marta leave the room before taking one. Explain, using Freudian theory, which part of Lucy's personality was responsible for his behaviour. (2 marks)
- Describe the role of the unconscious according to Freud. (2 marks)
- Evaluate the role of the unconscious in personality development. (8 marks)



# CHAPTER 22 THERAPIES/TREATMENTS: SYSTEMATIC DESENSITISATION, PSYCHOANALYSIS AND THE OBJECT RELATIONS SCHOOL OF THOUGHT

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- describe and evaluate systematic desensitisation
- describe and evaluate psychoanalysis, including free association and dream analysis, transference and counter-transference, and the object relations school of thought.

## GETTING STARTED

In Chapter 21 you will have learned about Freud's psychodynamic theory of mind and personality. Freud's theory has three basic concepts which are related to his type of therapy (which is called psychoanalysis). These are:

- the importance of the unconscious mind
- intrapsychic conflict between the id, ego and super ego
- ego defence mechanisms.

Using your knowledge of these concepts, discuss in pairs how the concepts may be used during psychoanalysis and what techniques might be used during a therapy session.

Therapies/treatments are used to treat a range of mental health problems such as phobias, mood disorders, anxiety disorders and other psychological problems. They can be categorised into psychological therapies, such as psychodynamic therapy (psychoanalysis), behavioural treatment, cognitive therapy, family therapies and humanistic therapy; or biological treatments, such as medication and psychosurgery. Therapies can be directive or non-directive. Directive therapies instruct a client to do certain things or to think in a different way. Non-directive therapies focus on making sense of the client's experiences and how the client understands themselves.

## THINKING LIKE A PSYCHOLOGIST

Consider the definitions of directive and non-directive therapies. Make a list of advantages and disadvantages of each in terms of the client experience and issues of social control. Discuss your opinions on the length of the therapy and their effectiveness with a partner.

## KEY TERMS

**desensitisation:** brought about by relaxation techniques taught before facing the phobic object

**systematic:** gradually facing up to the phobic object via a hierarchy of exposure (from least fearful to most fearful)

## SYSTEMATIC DESENSITISATION

**Systematic desensitisation** is a directive treatment typically used to treat anxiety disorders, such as phobias. The treatment was developed by Joseph Wolpe in the 1950s and is based on the principles of classical conditioning.

The aim of systematic desensitisation is to overcome irrational fears by gradually exposing an individual to their fear in a controlled way. This technique is based on the idea of reciprocal inhibition – that is, that you cannot be anxious and relaxed at the same time. Phobias are thought to be acquired through an unhelpful learned response to a particular stimulus. So the basis of this treatment is that just as you can 'learn to fear' something you can unlearn the



**LINK**

Classical conditioning is discussed on pages 228–233.

fear by relaxing when in contact with the phobic object. The therapist and client initially agree on a target aim for the therapy (for example, being able to handle an insect) and the client is taught relaxation techniques. Over several sessions, depending on the strength of the phobia and the client's ability to relax, the client is exposed to the object of their phobia until they are desensitised to the object. The process can either be *in vivo* (being exposed to a real object) or *in vitro* (through an imaginary exposure to object).

Systematic desensitisation involves these key processes:

- Functional analysis: a conversation between therapist and client to identify the nature of the anxiety and the possible triggers.
- Develop a hierarchy of fears: the client and therapist work together to create a hierarchy of fears, from the least anxiety-provoking situation to the most anxiety-provoking situation. For example, if a client has a phobia of birds, the least anxiety-provoking situation may be agreed as 'thinking about a bird', 'seeing a picture of a bird' and then 'being in the same room as a bird in a cage'. It is important that the client has input here and that they determine the speed at which the treatment progresses and the stages of hierarchy they progress through.
- Relaxation training: the client is taught how to relax using methods that suit them best. For example, this might be deep breathing exercises or visualisation, such as imagining being in a peaceful setting.
- Gradual exposure: working through the agreed hierarchy of fears, the phobic object is slowly and gradually introduced according to the scenarios agreed in the hierarchy. The therapist always works at the speed agreed by the client.
- Counterconditioning: through repeated pairings of the feared stimulus with relaxation, the client learns to associate the previously feared stimuli with relaxation rather than anxiety.



► Figure 22.1 A typical anxiety hierarchy of fears the least fearful to the most fearful situation

**SKILLS**

INITIATIVE, SELF-DIRECTION

**ACTIVITY 1**

Build your own hierarchy of fears for the following phobias:

- phobia of flying
- phobia of snakes
- phobia of buttons.



**LINK**

Capafons et al. (1998) is discussed further on pages 275–278, and can be used to support systematic desensitisation as an effective therapy for aerophobia (fear of flying).

**EVALUATION OF SYSTEMATIC DESENSITISATION**

Systematic desensitisation has proven effectiveness as a form of treatment. Most studies report that individuals receiving systematic desensitisation therapy improve more than a non-treatment group. Juan Capafons et al. (1998) recruited 41 Spanish participants who suffered from a fear of flying. Of this group, 20 participants were treated with systematic desensitisation and 21 were a waiting control group (a group who were waiting for systematic desensitisation therapy, but who had not yet received any treatment). In the treatment group, 18 reported lower levels of fear and were less anxious.

Behavioural therapies, such as systematic desensitisation, require considerably less time and effort in comparison with other therapies. It is also possible for people to administer the therapy themselves via computer simulations such as apps or virtual reality software. The therapy does not pose any significant ethical issues as the techniques employed, such as the fear hierarchy and relaxation techniques, ensure that the client is not exposed to any high anxiety situations.

**THINKING LIKE A PSYCHOLOGIST**

Systematic desensitisation is a treatment typically delivered by a therapist in a therapeutic environment. However, the use of technology has given rise to various electronic applications which can be accessed without the need to visit a therapist. Using your knowledge of systematic desensitisation and how it is conducted, consider the strengths and weaknesses of clients using electronic applications to treat their phobia.

**KEY TERM**

**generalised anxiety disorder:** a long-term condition where individuals feel anxious in a range of situations rather than about a specific object

Systematic desensitisation has a number of limitations, however. Firstly, it can only treat certain anxiety disorders. Situations or objects have to be clearly identifiable for the therapy to work so systematic desensitisation would be inappropriate for someone with **generalised anxiety disorder** (someone who worries about numerous imprecise situations). Moreover, systematic desensitisation appears to be less effective at treating phobias that have an underlying survival component, such as fear of the dark, or dangerous animals. One possible explanation for this is that these deep-rooted fears may have enabled our ancestors to survive by keeping them out of danger. It is therefore very difficult to remove such fears deep within our evolutionary past.



A fear of heights may be difficult to treat with systematic desensitisation for evolutionary reasons ▶



**LINK**

See page 246 for more on Freud's theory to explain how the unconscious influences behaviour and mental well-being.

**PSYCHOANALYSIS**

Psychoanalysis is a non-directive psychological therapy developed by Sigmund Freud. The aim of psychoanalysis is to give the client self-insight by making the unconscious conscious.

By exploring the unconscious, the client can understand its impact on thoughts and emotions. Through psychoanalysis, the client gains knowledge and understanding of their unconscious conflicts and relives these experiences in a safe environment. When a client is able to relive past experiences as an adult, they can respond more appropriately to these experiences and resolve any psychic conflicts and defences they may have.

Psychoanalysis begins with an initial assessment of the client's current concerns, personal history and relationships, and any symptoms they may be experiencing. Traditional psychoanalysis involves the client lying on a couch facing away from the therapist, and the therapist remaining anonymous. Being anonymous means that the therapist should not make any judgements about the client and not show any emotion. This establishes the therapeutic relationship and builds trust which is an essential process in psychoanalysis.



Freud's clients lay on a chaise lounge facing away from Freud while undertaking psychoanalysis ►

**FREE ASSOCIATION**

The client is encouraged to speak freely about their thoughts, memories, feeling and dreams using a technique called free association. The client is asked to not censor themselves at all, no matter how embarrassing or irrelevant the information may be. Free association aims to access information from the unconscious mind by weakening ego defence mechanisms which typically censor the unconscious mind. Clients are encouraged to talk about anything that comes to mind and should become more relaxed; in a non-judgmental environment, they may express themselves without filtering or distorting unconscious thoughts.

**DREAM ANALYSIS**

According to Freud, when we dream we are fulfilling our wishes and desires. When we report our dream to a therapist, we are reporting the manifest content of what we dreamt. However, dreams come about due to dreamwork. Dreamwork is the process of altering and disguising the actual wish or desire (the latent content) into the dream we experience (the manifest content).



One technique used in psychoanalysis is the interpretation of dreams, which aims to uncover the latent dream content to reveal what is in the unconscious. During dreamwork the latent content is disguised through displacement. Displacement is when we dream of something which is actually symbolic of something else. During sleep our ego defence mechanisms are weaker, allowing unconscious content to slip into the dream. The role of the therapist is to interpret these symbols to uncover the actual unconscious wish.

### TRANSFERENCE AND COUNTER-TRANSFERENCE

During the therapy sessions, the client may transfer their feelings and thoughts about a person or situation onto the therapist. This is known as transference and can involve the transfer of positive feelings, hostile feelings, romantic feelings or dependence on to the therapist as if they were a parent. It is the role of the therapist to interpret this transference to gain insight into the client's unconscious mind. Counter-transference refers to the therapist's emotional response to the client's transference. The therapist may transfer positive feelings of warmth towards the client, or negative feelings of frustration or irritation, feel protective towards the client, or have romantic feelings for them.

Both transference and counter-transference are important features of the therapeutic relationship, and the therapist should work to interpret them and explain their significance to the client.

### RESISTANCE

Psychoanalysis is about revealing the contents of the unconscious. A client may find this a difficult and painful process. A common response is for the client to show resistance because they are reluctant to explore certain distressing thoughts and emotions. Resistance can be displayed in different ways. For example, a client may not turn up for a therapy session or might be late, or they might change the topic of conversation during a session. Understanding the client's resistance may also become part of the therapy, which can be analysed by the therapist as this can also reveal the contents of the unconscious.

By working through these processes, the therapist can build up a picture of unconscious conflicts and explain them to the patient.

### EVALUATION OF PSYCHOANALYSIS

Psychoanalysis is a therapeutic approach which takes into account many factors about a person that may have led to them suffering from mental health issues. Unlike systematic desensitisation, which focuses on learned behaviour, psychoanalysis is a more holistic therapy. It has also led to the development of other therapies, such as the object relations school of thought.

Much of the therapy's principles are derived for psychodynamic/Freudian theory. Freud used case studies of his own patients to build a series of theories to explain human behaviour.

Interpretations of symbols and behaviours in free association, dream analysis and transference made by the therapist about the nature of the unconscious are subjective. A different therapist may have a completely different interpretation, meaning psychoanalysis is an unreliable therapy.

#### SKILLS

COMMUNICATION,  
COLLABORATION, INTELLECTUAL  
CURIOSITY

### ACTIVITY 2

To demonstrate how subjective psychoanalysis can be, consider how you would interpret the following symbols experienced in a dream:

- a cat scratching you
- flying in a dream
- being chased.

Now compare your interpretation of the dream symbols with someone else in your class. The likelihood is that you will have a completely different interpretation of the dream symbols.



**KEY TERMS**

**human psyche:** the human mind with all its conscious and unconscious aspects; thoughts, feelings, memories, and wishes

**internal working model:** a mental construct formed from our attachment experiences which influences our perception of relationships as stable/unstable, trusting/untrusting, secure/insecure

**spontaneous remission:** recovery without treatment

Psychoanalysis is also time consuming and costly. Therapy sessions last around an hour once a week and therapy can go on for many years. It is a talking therapy, which requires a degree of self-insight and understanding. It is a therapy which is inaccessible for many people.

A further weakness of psychoanalysis comes from research into its effectiveness. Hans Eysenck (1962) reviewed research into the effectiveness of psychoanalysis compared to other therapies in the treatment of neurosis. While psychoanalysis appeared effective in around half of the patients treated, it was also found that more patients seemed to recover after no treatment at all. Although other research suggests different rates of effectiveness and **spontaneous remission**, the issue here is that there is no consistent measure of 'cure'. In addition to this, there are individual differences between patients, therapists and type and duration of therapy that makes drawing conclusions about effectiveness unreliable.

**OBJECT RELATIONS SCHOOL OF THOUGHT THERAPY**

The object relations school of thought has its roots in psychodynamic theory. Object relations focuses on relationships we have with others, and the representation of others (known as 'objects') in the development of the **human psyche**. It also focuses on the importance of early childhood relationships with parents (objects). These early relationships shape our understanding of the world. We have internal representations of these objects which are formed through early attachments. The quality of the attachments we form with parents are internally represented and shape a person's **internal working model**. This internal working model of how relationships should be can have an influence on personality development.

Object relations school of thought therapy is a non-directive therapy that aims to understand a client's relationships and the internal representations of objects (people). Because object relations school of thought focuses on early attachments, the therapy also places emphasis on experiences in early childhood and the quality of attachments that were formed. A client is encouraged to talk about these early relationships and the feelings and thoughts they have about them. Similar to psychoanalysis, the therapist will analyse and explain incidents of transference and counter-transference. There is also analysis of symbols and exploration of the unconscious. However, object relations therapy focuses on relationships with others and how they have been internalised by the client. The goal of the therapy is to help clients differentiate between their self-identity and others, and to establish boundaries between them.

**EVALUATION OF OBJECT RELATIONS SCHOOL OF THOUGHT THERAPY**

The same criticism of psychoanalysis can also be made of object relations therapy, in terms of it being subjective. The therapist will analyse symbols in the client's internal world and the impact of early childhood relationships on a shaping of their internal working model. However, while subjectivity is present, therapists are trained to acknowledge and minimise subjective interpretation, instead working with the client in a collaborative way to facilitate a shared understanding of a client's experiences.

Object relations therapy is also based on extensive work in developmental psychology which demonstrates the importance of early childhood relationships of later development. However, in the same way as psychoanalysis, object relations therapy is built on case study evidence and it is difficult to measure its effectiveness.

**LINK**

This will be discussed further when you learn about John Bowlby's theory of attachment and Mary Ainsworth's research on attachment types in Topic E: Developmental Psychology (see Chapter 1 of Student Book 2).



## SKILLS

## CRITICAL THINKING, ADAPTIVE LEARNING

## CHECKPOINT

- Which statement relates to each therapy discussed in this chapter?
  - A non-directive therapy used to make the unconscious conscious.
  - A non-directive therapy used to understand internal representations of relationships.
  - A directive therapy used to substitute fear with relaxation.
- Identify which feature of psychoanalysis is being described in the following definitions:
  - When a client turns up late to a therapy session.
  - A client is asked to talk about anything that comes into their mind.
  - Feelings the client has for the therapist are analysed.
  - Feelings the therapist has for the client are analysed.

## SKILLS

## CRITICAL THINKING, EVALUATION

## EXAM TIP

When asked to explain or discuss 'how' a therapy can be conducted, remember that this is a process, just like following a recipe to make a meal. It might help to frame your answer using 'firstly', 'secondly', 'thirdly' to make sure you write enough points.

## EXAM PRACTICE

- Saisha is a psychoanalyst. She has a new client, Omal, who has come to her for psychoanalysis because he has a phobia of flying. Discuss how Saisha might use psychoanalysis to help Omal with his phobia of flying. (4 marks)
- Explain one strength and one weakness of the object relations school of thought therapy. (4 marks)
- Judith has developed a phobia of cats following an incident where a cat unexpectedly jumped out at her and bit her hand. Discuss systematic desensitisation as a treatment for Judith's phobia of cats. (8 marks)



# CHAPTER 23 METHODS

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- describe and evaluate the use of the observational research method, including the gathering of qualitative and quantitative data
- describe and evaluate the different types of observation: participant, non-participant, structured, naturalistic, overt and covert
- describe and evaluate the use of content analysis as a research method
- describe and evaluate Freud's use of the case study as a research method
- understand qualitative and quantitative data
- use thematic analysis to analyse qualitative data
- use the chi-squared statistical test
- describe and evaluate the use of animals in laboratory experiments, including where the results can be related to humans and animal ethics.

## GETTING STARTED

Conducting an observation involves a series of planned steps.

1. Decide what behaviour you are going to observe and who you will observe.
2. Decide where you will observe the behaviour.
3. Make a table to record the observed behaviour.
4. Decide whether you will record all behaviour in a specified timeframe or tally specific behaviour as they occur.
5. Analyse your findings.

Imagine that you have been asked to observe different types of communication in an office environment. Some areas of the office are open plan and other areas have desks divided by screens. It is predicted that an open plan office space encourages verbal communication, whereas the office area divided into cubicles promotes electronic communication. In pairs, develop a plan using the steps above to describe how you could go about conducting this observation.

## OBSERVATIONAL RESEARCH, INCLUDING GATHERING QUALITATIVE AND QUANTITATIVE DATA

Many research methods use observation, for example laboratory experiments and case studies; however, observation as an actual research method involves observing as the main way of obtaining data and where there is no independent variable to manipulate. All data is therefore gathered by simply observing/listening and recording behaviour.

### LINK

You will have read about independent and dependent variables on page 103.

The researcher has to decide what type of data they would like to collect using the observation method: quantitative data or qualitative data. Quantitative data is where the data gathered can be counted or expressed numerically; for example you could count the number of times that a child you observed picks up a gender-stereotyped toy. Qualitative data, on the other hand, cannot be expressed numerically but is concerned with words, texts, ideas and themes. For example, you could observe and record how parents play with their children by writing down what they say to their child and any non-verbal communication they use.

Data collection in observational research might include tallying, where observers write down when and how many times certain behaviours occurred. They may also take notes during the observation session and review them later to try to determine behavioural patterns from the notes. Alternatively they may use audio or video recordings.



TABLE 23.1: AN EXAMPLE OF A TALLY CHART TO SHOW THE TOTAL NUMBER OF MALES AND FEMALES WHO DRIVE A SMALL AND LARGE CAR

	Male	Female
Small car	III	III
Large car	IIII	II

Table 23.1 shows an example of a tally chart. Here the researcher is interested in observing whether men and women have a preference for different sized cars. Once they are ready for the observation, they simply 'tally' or note down in the appropriate cell each time they see a person in a certain category, so for example, when they see a female driving a small car, they make a tally in the female/small car cell.

The categories for observation need to be clear and unambiguous. In larger scale studies, observers need training to ensure that they understand the criteria for each category, known as the operational definitions of behavioural categories. Training and standardisation of observers is important where more than one observer is making an assessment.

When a lot of data needs to be recorded researchers often use a specific technique to gather information, for example time sampling or event sampling. Time sampling involves making observations at different time intervals, for example every 30 seconds, and recording all of what is observed. This may not always be representative as certain behaviours can be missed if they are only recorded at certain times. Event sampling involves recording a certain behaviour every time it happens, for example ticking a box every time someone displays a particular behaviour. These behaviours will be decided before undertaking event sampling, and a tally will be made each time the predetermined behaviour is displayed. A problem with this approach is that if too many instances of the behaviour happen at once, the researcher may not be able to record all instances.

## TYPES OF OBSERVATION

Observations fall into different categories: structured and naturalistic, participant and non-participant, overt and covert.

### Naturalistic and structured

**Naturalistic observation** involves observing the behaviour of participants within their own environment. The situation has not been created by the researcher and so allows them to gain a real insight into a person's behaviour. This type of observation has higher ecological validity because participants will be acting naturally and spontaneously in a familiar setting. However, participants may not know they are being observed so it can pose ethical issues of consent and right to privacy. However, naturalistic observations have limited control over extraneous variables that may affect participants' behaviour and are unlikely to be able to be repeated exactly again.

#### LINK

Ecological validity and extraneous variables are discussed in detail on page 109.

#### KEY TERM

**naturalistic observation:** watching and recording behaviour in a natural environment where the observed behaviour would normally occur

It may also be the case that the behaviour that is expected to be seen is not displayed by participants. In such a case it may be better to set up a structured observation where variables are manipulated to ensure the behaviour is displayed by participants. For example, Mary Ainsworth et al. (1978) wanted to investigate parent-child attachment in a controlled way. She set up the 'Strange Situation Procedure' which involved observing how a child reacted when their mother left a room, the child's response to a stranger entering, and the child's behaviour when reunited with their mother. This would have been difficult to observe in a natural



environment because the series of events would not often occur naturally. Mary Ainsworth decided to use a structured observation to be able to gather data in a controlled environment.

**LINK**

You can read more about Mary Ainsworth in Chapter 1 of Student Book 2.



▲ Mary Ainsworth used a structured observation to investigate parent–child attachment

**KEY TERMS****non-participant**

**observation:** a form of observation where the researcher observes behaviour of others but does not form part of the group they study

**structured observation:** watching and recording behaviour in an artificial environment, where a situation is manipulated to encourage a behaviour

**Structured observations** are staged observations and are normally carried out within an environment in which the researcher has some control, such as a laboratory. Behaviours can be observed through a one-way screen. Structured observations are set to record behaviours where it would be difficult to gain information from naturalistic observations, just like Mary Ainsworth did. An advantage of using a structured observation is that it allows for the control and manipulation of variables. In this way we can draw firm conclusions about the cause of a behaviour that has been observed. This means they can also be replicated. However, they are conducted in unnatural conditions, so the behaviour displayed by participants is unlikely to be spontaneous or naturally occurring. Participants will be aware that they are being observed, which can lead to them modifying their behaviour in some way. This means that it has low ecological validity. However, as participants are likely to be aware that they are taking part in an observation, they can give consent and exercise their right to withdraw.

**Non-participant and participant**

**Non participant observations** are when the observer observes and records the behaviour of participants from a distance. They are not involved in the group or situation they are observing. If the participants are aware of being observed by someone from a distance, they may alter their behaviour because they are aware of being watched, so may not display natural behaviour. Because the observer is detached from who they are observing, they may not fully understand why a behaviour is being displayed or may interpret a behaviour in a subjective way. This is known as observer bias. However, these observations do allow researchers the opportunity to concentrate on recording data and collect data more objectively.



## KEY TERM

**participant observation:** a form of observation where the researcher takes an active role in the situation being observed

## SKILLS

CRITICAL THINKING,  
INTELLECTUAL CURIOSITY,  
COLLABORATION

**Participant observations** are when the observer joins the group that they are observing, so they become involved in the activity or situation. One advantage of this is that there is no stranger observing the behaviour, which could impact on how participants behave. It may also reveal data that might be missed by other methods. However, by taking part it may be hard to record notes of the observations and, if the researcher is part of the group being investigated, they could lose their sense of objectivity.

## ACTIVITY 1

Observations can result in misinterpreting behaviour that is seen because we impose our own understanding of what we are seeing. This is known as observer bias.

In pairs, consider the following observed behaviours which have been misinterpreted. Can you work out how they have been misinterpreted and different possible interpretations?

- A student rushes through a doorway without holding the door open for other students. This is recorded as rude behaviour.
- A teacher observes preschool children in the playground tapping each other on the back. The teacher reports that the children are hitting one another.
- During exams a student spends a lot of time in their bedroom. Their parents think that they are becoming socially withdrawn.
- A senior teacher is conducting lesson observations. In one lesson a child is observed to be fidgeting and not engaging in the lesson. The senior teacher reports the child as being naughty.

## KEY TERMS

**covert observation:** a form of observation where the participants do not know they are being observed. For example, you make an observation of behaviour in your student area, while simply sitting in one of the seated areas

**overt observation:** a form of observation where those being observed are aware of the presence of an observer. For example, an inspector comes into classroom to observe teacher/pupils

## Overt and covert observations

**Overt observations** are where the person being observed is aware that they are being observed whereas **covert observations** mean the participants are unaware they are being observed. An advantage of overt observations is that informed consent can be obtained and participants can also be informed of their right to withdraw. Covert observations are more problematic on ethical grounds as participants are unaware they are taking part. However, this is also an advantage as participants are unlikely to change their behaviour in a presence of an observer, thus making the observations more valid, which is not the case with overt observations.

Observations can be structured or naturalistic, participant or non-participant, overt or covert. So a researcher may conduct a naturalistic, participant overt observation such as in anthropology where a researcher joins a tribal group to understand its customs and rituals. Or an observation can be structured, non-participant and covert, where participants' behaviour is secretly observed behind a one-way mirror in a laboratory setting.

## EXAM TIP

In order to show your understanding of the different types of observation methods, you should be ready not only to outline what is involved, but also give examples to illustrate your understanding – this could be with reference to specific studies that might have used the same methods.

Remember to explicitly state which type of observation you are describing or evaluating. Ethical and methodological issues that apply to one type of observation type may not apply well to a different type. For example, participant observations affect the behaviour of those being observed, but this may not be true of covert non-participant observations.



**SKILLS****CRITICAL THINKING,  
SELF-DIRECTION****ACTIVITY 2**

The different types of observation may be associated with ethical or methodological issues. Rate each type of observation (on a scale of 1–5) according to the criteria set out in the table. Note: a rating of 1 means no issue and 5 means a significant issue.

Type of observation	Ethical issues	Subjectivity	Reliability and validity	Observer effects
Naturalistic				
Structured				
Participant				
Non-participant				
Covert				
Overt				

**CONTENT ANALYSIS**

Observations may not involve observing participants' behaviour directly, but instead observing the incidence of other things. Content analysis is typically used as a research tool for analysing content (for example, the incidence of certain words, images or concepts within material), typically in advertisements, books, films, newspapers, etc. For example, a researcher may use content analysis to observe instances of gender stereotyping in children's books. Therefore, content analysis is a form of indirect observation.

When conducting content analysis, categories should be agreed in advance. In the example of gender stereotyping in children's books, the researcher may examine instances where males and females show stereotypical behaviour and where they show non-stereotypical behaviour. The researcher will go through the selected material and tally (count) the number of times that each of these categories occur. The researcher may also use qualitative analysis in their content analysis to examine the meanings and relationships of words, concepts and pictures, and then make inferences about the messages contained within them. In content analysis it is vital that the content to be analysed is coded into clear and manageable categories so that appropriate conclusions can be drawn.

**EVALUATION OF CONTENT ANALYSIS**

A clear advantage of content analysis is that it is an unobtrusive method where there are rarely ethical issues associated with the research, as data is collected from existing sources rather than live participants; nevertheless, researchers should respect confidentiality. The content analysis may also offer the opportunity for a fresh interpretation of existing data, which may not be achieved via other methods. It is very useful for analysing historical material and documenting trends over time. Reliability can be easily assessed as the content analysis can be easily replicated using the same categories.

Content analysis does, however, rely on the personal interpretation of the researcher and therefore involves an element of subjectivity or bias. There are also potential issues of internal validity as the categories used should represent what they intend to measure, otherwise the data will not be valid.

Content analysis is a purely descriptive method. It describes what is there, but may not reveal the underlying motives for the observed pattern ('what' but not 'why'). The content analysis may be limited by the availability of material. Furthermore, observed trends in the media may not accurately reflect reality; for example dramatic events usually receive more coverage than less



dramatic events. If sources are only used from one culture or the content analysis is performed by someone from one culture, the findings may be culture-biased.

### WIDER ISSUES AND DEBATES

#### Psychology as a science

Both observational research and content analysis as research methods require a researcher to record the instances they believe a behaviour/category is being displayed. This can be subjective, as a different researcher may not record the same instance of a behaviour/category. Subjectivity can mean that the outcomes are unreliable, which is an important feature of science. To make observations and content analysis more objective it is good practice to have more than one observer conduct the observation or reanalyse the data collected. This is known as inter-observer reliability. The rate of agreement between the observers is calculated and published alongside the data.

### FREUD'S USE OF THE CASE STUDY AS A RESEARCH METHOD

A case study is a detailed investigation into one individual or small group of people. They are typically used to investigate someone who is unique/rare or has experienced something that could have not ethically or practically been conducted in a laboratory. In a case study, many different research methods can be used, such as observations, interviews, and experiments. The outcomes of these different methods can be compared to look for trends.

#### LINK

Case studies with brain-damaged patients are discussed on pages 128–132.

Freud used case studies to gather in-depth information from his clients. He used free association, dream analysis and observations of clients' behaviours to uncover unconscious wishes and desires. Freud's case studies not only informed his theories, but were also used as a therapy.

#### LINK

The methods used in Freud's case studies are discussed further on page 248.

When conducting his case studies, Freud would see his clients individually. They would typically lie on a couch facing away from him to encourage them to talk without censorship. He would interpret what his clients told him and hope that something from the unconscious would reveal itself. Freud would look for 'Freudian slips', when a client says something that they did not mean. Freudian slips occur when the unconscious reveals itself. Freud would also analyse his clients' dreams and look for transference and counter-transference. Once all of this information has been gathered, Freud would analyse this qualitative data and give his interpretation of the unconscious to the client.

### EVALUATION OF FREUD'S USE OF CASE STUDIES AS A RESEARCH METHOD

Case studies are sometimes the only way of gathering information because they cannot ethically be achieved by other research methods. For example, Freud would not have been able to cause hysteria in a client in order to research it – he needed clients to present themselves with these symptoms.

Freud's case studies also had high ecological validity because he gathered data directly from the individual in a natural setting. He was able to gather a lot of detailed information about the



client through the use of free association and dream analysis, which he could then use to both treat the patient and gather information to develop his theories.

A criticism of Freud's case studies are that he only conducted them on unique individuals, and these were typically middle-class Viennese women. Therefore it is difficult to generalise the information gathered to anyone else. Another criticism is that it is hard to draw out a general theory, as different analysts may find different meanings to a client's free association or symbols in dreams. These different interpretations make Freud's use of the case study subjective. Freud was also investigating concepts, such as the unconscious, which cannot be directly observed so the information he gathered could not be empirically verified.

#### EXAM TIP

In addition to the methods and techniques covered in this chapter, you will also need to draw upon your knowledge of methodology from previous chapters. Specifically:

- analysis of quantitative data: calculating measures of central tendency (mean, median, mode)
- data tables (frequency tables and summary tables)
- graphical presentation (bar chart, histogram)
- measures of dispersion (range and standard deviation)
- percentages, ratios, fractions
- normal and skewed distribution
- analysis of qualitative data using thematic analysis.

These methods were covered in Chapters 11 and 12.

## ANALYSIS OF DATA: THE CHI-SQUARED STATISTICAL TEST

#### LINK

You learned about the use of inferential statistics on pages 112–114. If necessary, revisit this now before moving on to learn about the chi-squared test. Specifically you will need to go back to Chapter 12 and look at the section on decision-making and interpretation of inferential statistics:

- levels of measurement (nominal, ordinal, interval, ratio)
- probability and levels of significance ( $p \leq .10$ ,  $p \leq .05$ ,  $p \leq .01$ )
- observed and critical values, and sense checking of data
- one- or two-tailed regarding inferential testing type I and type II errors.

The chi-squared test is a test of association or difference which is conducted on nominal data.

#### REASONS FOR CHOOSING A CHI-SQUARED TEST

There are different reasons for choosing the chi-squared test:

- where you have a hypothesis that is predicting a difference or an association. For example, a researcher may predict that boys and girls will show differences in the toys they choose to play with at nursery, or to test whether there is an association between car colour preference and urban/rural dwellers



## KEY TERM

**independent measures:** an experimental/research design where different groups of participants are used in each condition of the study

- where your level of measurement is nominal. For example, the researcher could use two categories here – ‘stereotypical’ and ‘non-stereotypical’ toys and boys and girls, or urban and rural dwellers and a preference for red or blue cars
- where your participant design involves **independent measures**, that is you have at least two different groups being studied, for example boys and girls.

## LINK

You might find it helpful to reread the section on cognitive methods on pages 112–125.

CARRYING OUT A CHI-SQUARED TEST ( $\chi^2$ )

This is a test for difference or association where two or more independent sets of data are compared to see if they are different/related. It is used with nominal data, when the results are gathered in groups/categories. This test is used to gather occurrences within each group or ‘frequency data’. Chi-squared tests can be used to question differences or common ground between two groups.

It is important not to translate numbers into averages or percentages here; use the total number to gain a reliable result. Using a chi-squared test requires you to put the data into a contingency table.

## EXAM TIP

A chi-squared test is often conducted on observational research or content analysis, where frequencies have been recorded and tallied. A clue that suggests a chi-squared test should be used is that these frequencies are totalled. It is not used to analyse data when participants’ individual scores are known.

## WORKED EXAMPLE

Consider the following worked example. A researcher is researching whether four-year-old children show stereotypical choices in the toys they play with at nursery. They want to investigate whether girls and boys play with gender-stereotypical toys (girls play with dolls and boys play with cars) or whether they play with non-stereotypical toys (boys play with dolls and girls play with cars). Table 23.2 is an example of a table, known as a contingency table, because each cell shows the frequency of observed behaviour. It shows the frequency of toys played with by boys and girls.

TABLE 23.2: A CONTINGENCY TABLE TO SHOW CHILDREN AND TOY CHOICE: A WORKED EXAMPLE

	Stereotypical toy	Non-stereotypical toy	Row total
Girls	8 (Cell A)	12 (Cell B)	20
Boys	17 (Cell C)	3 (Cell D)	20
Column total	25	15	40 (overall total)

In this instance as the observed value of 8.64 is greater than the critical value of 2.71, we can reject our null hypothesis and support our alternative hypothesis and conclude that boys and girls differ in their choice of stereotypical and non-stereotypical toys. If the observed value was less than the critical value the reverse would be true and we would have to reject the alternative and accept the null hypothesis in that toy choice was based on chance.



### CALCULATING A CHI-SQUARED TEST

The formula for a chi-squared test is:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Chi-squared is calculated as follows.

**Step 1:** Place the data gathered from the observations into a contingency table like the one shown in Table 23.2. This is a  $2 \times 2$  contingency table as there are two rows and two columns. It is possible to have other variations such as a  $3 \times 2$  table depending on your research design.

**Step 2:** Calculate 'expected frequency' for each cell using the formula:

$$\text{Expected frequency (E)} = \frac{\text{row total} \times \text{column total}}{\text{overall total}}$$

Therefore:

$$\text{Cell A} = 12.5 \quad \text{Cell B} = 7.5 \quad \text{Cell C} = 12.5 \quad \text{Cell D} = 7.5$$

**Step 3:** Subtract expected value ( $E$ ) from observed value for each cell ( $O - E$ )

$$\begin{aligned} \text{Cell A} &= 8 - 12.5 = -4.5 & \text{Cell B} &= 12 - 7.5 = 4.5 & \text{Cell C} &= 17 - 12.5 = 4.5 \\ \text{Cell D} &= 3 - 7.5 = -4.5 \end{aligned}$$

**Step 4:** for each cell  $(O - E)^2$

$$\text{Cell A} = 20.25 \quad \text{Cell B} = 20.25 \quad \text{Cell C} = 20.25 \quad \text{Cell D} = 20.25$$

**Step 5:** for each cell  $\frac{(O - E)^2}{E}$

$$\begin{aligned} \text{Cell A} &= 20.5/12.5 = 1.62 & \text{Cell B} &= 20.25/7.5 = 2.7 & \text{Cell C} &= 20.25/12.5 = 1.62 \\ \text{Cell D} &= 20.25/7.5 = 2.7 \end{aligned}$$

**Step 6:** Add all the values from the previous stage to get the observed value ( $\chi^2$ )

$$1.62 + 2.7 + 1.62 + 2.7 = 8.64$$

**Step 7:** Calculate degrees of freedom (df)

$$(\text{rows} - 1) \times (\text{columns} - 1)$$

$$(2 - 1) \times (2 - 1) = 1$$

**Step 8:** Look up critical values in Table 23.3 below using the degrees of freedom and considering whether you have a directional (one-tailed) or non-directional (two-tailed) hypothesis.

In this example, at a significance level of  $p = 0.05$  with a one-tailed test (we have a directional hypothesis because it can be predicted that boys and girls toy choices will be stereotypical), the critical value is 2.71.

**Step 9:** Compare observed and critical value. If the observed is *equal* to or *greater* than the critical value, it is significant.

TABLE 23.3: CRITICAL VALUES TABLE FOR A CHI-SQUARED TEST

Degrees of freedom (df)	Levels of significance (one-tailed test)		
	0.05	0.025	0.01
	Levels of significance for a two-tailed test		
	0.10	0.05	0.02
1	2.71	3.84	5.41
2	4.60	5.99	7.82



In this instance as the observed value of 8.64 is greater than the critical value of 2.71, we can reject our null hypothesis and support our alternative hypothesis and conclude that boys and girls differ in their choice of stereotypical and non-stereotypical toys. If the observed value was less than the critical value the reverse would be true and we would have to reject the alternative and accept the null hypothesis in that toy choice was based on chance.

#### LINK

The null hypothesis and alternative hypothesis are discussed in the section on cognitive methods on page 102.

### THE USE OF NON-HUMAN ANIMALS IN LABORATORY EXPERIMENTS

As we have seen so far, researchers within the 'learning approach' developed their methods from natural sciences, particularly those earlier on in the development of this approach; for example, the use of lab experiment conditions, in which a variable (independent variable) is manipulated to see its effect on resulting behaviour of subjects. Learning theorists such as Pavlov and Skinner made significant use of experimentation on non-human (animal) participants. We will now consider the arguments for and against animal research.

#### LINK

Pavlov and Skinner are covered in detail in Chapter 20.



The use of animals in psychological research can be controversial on ethical and moral grounds ►

### ARGUMENTS IN FAVOUR OF USING NON-HUMAN ANIMALS

Rats are frequently used in psychological research because of the speed at which they produce offspring: a rat's gestation period is typically 22 days and therefore large samples can be bred in short time frames. Also, when investigating a characteristic across generations, for example aggression, the researcher does not have to wait so long for such results to become apparent.



It is argued that laboratory experiments have a degree of internal validity as non-human animal participants are naive about what is happening, since behaviour is unlikely to change due to demand characteristics that are likely in humans.

**LINK**

Demand characteristics are discussed in the section on cognitive methods on page 105.

Experimentation using animals offers researchers a higher degree of control compared to when using humans. For example, non-human animals can be caged in a way that humans cannot, and you can isolate variables from animals in ways that would be more difficult for human participants, such as placing them in a Skinner box and dispensing food when the animal presses a lever.

While unnecessary pain must be avoided, pain and distress is permitted, which is not the case for human participants; for example Skinner gave electric shocks to animals in his Skinner box. However, animal research is heavily regulated and controlled by legislation to ensure that correct housing and treatment is provided. Laboratories also undergo regular inspections to check the welfare conditions of animals being studied.

**LINK**

The Skinner box is discussed on page 234.

Animal research has provided significant insight into vital areas of medical research including drug treatments, transplants, surgical techniques and cloning. Animal research has made a significant contribution to what we know about the brain and nervous system. Conditioning techniques have been used successfully in therapeutic settings.

From an evolutionary perspective, humans share common ancestry with other animals, particularly primates, and therefore non-human animal research gives valid information on human processes. We share basic nervous system structures and functions that mean that we are able to generalise to some extent from non-human animals to humans.

From an ethical perspective, the **utilitarian argument** would suggest that the suffering of a small number of animals is justified because it helps a significant number of people; moreover some would argue that we have a moral obligation to our own species to advance knowledge and reduce suffering. Gray (1991) would argue that animal research is justified if it furthers this cause.

**KEY TERM**

**utilitarian argument:** applied to animal ethics, this perspective would argue that the interests and welfare of animals should be given equal consideration as humans

**ARGUMENTS AGAINST THE USE OF NON-HUMAN ANIMALS**

Many people would argue that animal research lacks credibility and ecological validity. Lab-based animal research produces behaviour that is different from animals' natural behaviour. Moreover, there are just too many differences between humans and non-human animals. Consider a simple example: a new-born mouse in terms of development and hormonal influence is equivalent to a seven-week-old foetus – so can comparisons really be made? Extrapolation may also reduce the validity of the research. Generalisations between non-human animals and humans are also guilty of anthropomorphism (where non-human animals are mistakenly attributed with human qualities).

Human and non-human animals are very different. There are differences in human and non-human animal evolution and our genetic make-up. We act differently both cognitively and emotionally. Our behaviour and thought processes are subject to many more variables such as, for example, cultural context/social norms and language. Physiologically, our brains differ from non-human animals; humans have a much larger cortex proportionally than any other animal. This therefore suggests that generalising from non-human animals to humans has questionable value.



A researcher should always avoid inflicting pain and discomfort on non-human animals unless the findings have a significant benefit for humans. The problem is that the benefits of research are not known until after the study, so it is possible that their use in the study has limited effect. This does raise wider ethical issues. Others point to the inconsistency in continuity argument. If non-human animals are so similar to humans why should they therefore not be afforded the same ethical considerations as us?

From a moral perspective, the utilitarian argument would suggest that the research gives human suffering priority over animal suffering. Singer (1975) viewed this as a form of discrimination, which he termed speciesism. It could be argued that non-human animals have the same rights as humans and we have a moral obligation to protect them. In this argument, no amount of regulation can justify animal research.

### **ETHICAL ISSUES REGARDING THE USE OF ANIMALS IN LABORATORY EXPERIMENTS**

There are many ethical issues that emerge from using animals for research and these differ from the ethical standards applied to human research. Legislation that protects the rights of animals in scientific research has advanced significantly since the days of Pavlov and Skinner. The Animals (Scientific Procedures) Act (1986) covers all animal research conducted in the UK. It relates to 'any scientific procedure that may cause pain, suffering, distress or lasting harm to a 'protected' animal.' Protected animals comprise all non-human vertebrates and a single invertebrate species (the octopus). Psychologists are expected to comply with this act. They are also directed to follow the Animal Welfare Act (2006), which discusses more general duties of care towards animals regulated by the UK government. Other countries have their own specific national regulations and guidance concerning psychological research using non-human animals. In Europe these national regulations are governed by Directive 2010/63/EU, which has regulation for the protection of animals for the purpose of scientific research.

In the UK, the British Psychological Society (BPS) clearly states that permission to perform animal procedures regulated under the 1986 Act will not be granted unless the researcher can justify the costs to the animals in relation to the likely benefits of the research. This restricts someone from simply using animals in experiments because there is a curious interest. It has to be shown to have some potential value in undertaking the research. Other countries have their own national psychological guidelines which regulate or give guidance on the use of animals in psychological research.

When permission to perform a regulated procedure is requested, the researcher is also required to demonstrate that consideration has been given to the three 'R's (Russell and Burch, 1959) to minimise pain and distress for animals:

- replacing animals with non-sentient alternatives whenever possible (animals that show no signs of intelligence or self-awareness)
- reducing the number of animals used
- refining procedures to minimise suffering.

To maximise protection of the animals, all animal research must be licensed, with each project given a new licence. This licence will specify the species and number of animals to be used. It is only granted once it has been decided that the benefits of undertaking the research outweighs any cost to the animals. Individuals undertaking the research are also required to have a personal licence, which is only given after training to ensure the person is competent to perform the procedures. Researchers are required to seek to minimise any pain, suffering or distress that might arise, given the requirements of the experimental design. Whatever procedure is in use, any adverse effects on animals must be recognised and assessed, and immediate action taken whenever necessary. The licensed researcher has responsibility to make sure this happens. Researchers must also apply for a 'place' licence which regulates the conditions in which the animals are kept, such as housing conditions. These places are regularly inspected.



SKILLS

ADAPTIVE LEARNING, ANALYSIS

CHECKPOINT

1. Copy out the table below and match the type of observation with each scenario:

1. Maya waited outside a cinema to record who went inside	a) Structured
2. Leo secretly watched students in a common room	b) Naturalistic
3. Asha told students coming into the dining room that she would be watching who they chose to sit next to	c) Participant
4. Benito staged a play area in a laboratory to investigate how children play	d) Non-participant
5. Carlos joined a group of bikers to study how they behaved around other biker groups	e) Covert
6. Jamal watched and recorded a group of people from a distance	f) Overt

2. With regard to animal research, name the 'three Rs' and the 'three Ps'.  
 3. Choose the three conditions for using a chi-squared test.

Independent groups

Ordinal data

Test of difference or association

Interval data

Test of difference

Ratio data

Repeated measures

Test of relationship

Nominal data



## SKILLS

CRITICAL ANALYSIS, EVALUATION,  
REASONING

## EXAM PRACTICE

1. Niro was investigating heights as a phobia. He went to the top of a tall building which has a glass walkway. Visitors to the building could choose a path across the glass walkway or a path that avoided the glass walkway. Niro observed how many people chose to take the glass walkway or the different path. Explain one strength and one weakness of Niro using an observation research method in this study. (4 marks)
2. Angelo observed the behaviour of children aged two to four years in a local nursery. Each child was observed for five minutes and the number of times they played with each toy was tallied.

Table of results to show the frequency of toys played with by boys and girls:

	Toys: car, aeroplane, building blocks	Toys: doll, dressing up clothes, kitchen
Boys	18	32
Girls	34	12

- a) Angelo used a chi-squared test to analyse the data from his study. Justify the use of a chi-squared test for this data. (2 marks)
  - b) Angelo calculated chi-squared for his observation and found a calculated value of 13.87. Explain whether Angelo found a significant difference at  $p \leq 0.05$ , using a two-tailed (non-directional) test where  $df = 1$ . (2 marks)
3. Evuska carried out an observation to investigate whether younger drivers, aged 25 years and below, or older drivers, aged 50 years and above, were more likely to use their mobile/cell phone while driving. She used time sampling. Describe how Evuska may have carried out the observation using time sampling. (3 marks)
  4. Evaluate content analysis as a research method. (8 marks)



# CHAPTER 24 STUDIES

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- describe and evaluate one classic study by Watson and Rayner (1920): Conditioned emotional reactions
- describe and evaluate one contemporary study by Capafóns et al. (1998): Systematic desensitisation in the treatment of the fear of flying
- describe and evaluate a contemporary study from one of the following:
  - Prot (2014) Long-term relations among prosocial-media use, empathy, and prosocial behavior
  - Bastian et al. (2012) Cyber-dehumanization: Violent video game play diminishes our humanity.

## GETTING STARTED

The studies in this chapter are all about how our behaviour can be influenced by exposure to different situations. Look at the following list of situations:

- being exposed to positive role models on television
- being punished for being violent in a video game
- being rewarded for helping an opponent in a video game
- being conditioned to fear an object.

Select one situation and consider how you would go about designing an experiment to test whether behaviour could be influenced. Consider how you would recruit participants, what variables would need to be controlled, what apparatus would be needed and what ethical considerations would need to be made.

## WATSON AND RAYNER (1920): CONDITIONED EMOTIONAL REACTIONS

John Watson and Rosalie Rayner wanted to see if they could condition a phobic response to a white rat in an infant.

### AIM

Using the principles of classical conditioning, they wanted to investigate if a human child could learn to be afraid of a previously neutral stimulus, a white rat, which initially caused no fear response, and whether this reaction would be generalised to similar objects.

### SAMPLE

Using a single case experiment, Watson and Rayner selected one child, 'Albert B', a nine-month old infant chosen for his 'stolid and unemotional' character. He was given the pseudonym 'Little Albert'. Little Albert was raised almost from birth in a hospital environment as his mother was a wet nurse in the Harriet Lane Home for Invalid Children. Little Albert was healthy from birth, described as one of the best developed youngsters brought to the hospital, and weighed 21 pounds at nine months of age.



► Figure 24.1 Little Albert was conditioned to develop a phobia



## PROCEDURE AND RESULTS

Watson and Rayner initially tested Little Albert's responses to various stimuli, such as a dog, a mask, a white rat, cotton wool and burning newspaper. Little Albert did not respond adversely to any of them until they struck a hammer on a four-foot pole hanging from the ceiling. They noted that initially Albert showed a startled response. On the second hitting of the pole, the same thing occurred and his lips began to pucker. On a third hitting of the pole, the child broke down in a crying fit. The strike of the hammer was used as the unconditioned stimulus.

The actual conditioning of a phobia did not start until two months later, when Little Albert was 11 months and three days old. He was placed on a mattress on a table in a well-lit room. Before conditioning took place they presented Albert with a white rat. No fear reaction was noted. Indeed he tried to reach out for it as it roamed around him. It was only in later trials, when Watson hit the steel bar suspended from the ceiling behind Albert's back when he touched the rat, that Albert demonstrated fear. At first, Albert was shocked but did not cry. This was done a second time and Little Albert jumped violently and whimpered.

At 11 months and ten days old, the white rat was presented to Little Albert with no noise. He was also presented with wooden blocks, which he played with. Then the white rat was presented again, this time with the metal bar being struck. Little Albert was startled and fell over. This was repeated two more times and then the white rat was presented on its own. Following this the rat and noise were presented simultaneously and then the white rat alone. Little Albert began to cry and crawled away.

At 11 months and 15 days old, Little Albert was presented with the wooden blocks to which he showed no fear. Then he was presented with the white rat on its own, from which Little Albert leaned away. Little Albert was presented with the blocks and then the white rat and then the blocks again. Little Albert smiled and played with the blocks, but was upset and tried to crawl away from the rat. Then a rabbit appeared and Little Albert burst into tears, buried his head in the mattress and tried to crawl away. Watson and Rayner then presented a dog, seal fur coat, cotton wool and Watson's own head to play with his hair, and also a Santa Claus mask. Little Albert showed a negative reaction to all furry stimuli. Between each stimuli Little Albert was given the blocks to play with to calm him down.

### SKILLS

CRITICAL THINKING,  
ADAPTIVE LEARNING

### ACTIVITY 1

Revisit the concepts of stimulus generalisation and stimulus discrimination on page 231. Can you identify stimulus generalisation and stimulus discrimination in Watson and Rayner's study of Little Albert?

### LINK

The key terms relating to classical conditioning are all covered on pages 228–233.

At 11 months and 20 days, Little Albert was presented with the blocks alone and then the white rat alone. He did not cry at the rat, but withdrew himself away from it. To refresh the response, the rat was placed on Little Albert's hand and the steel bar was struck. His reaction to this was recorded as 'violent'. The rat was presented alone two more times and Little Albert fell over and tried to crawl away. He then played with the wooden blocks.

To refresh his fear of the rabbit and dog, he was presented with a rabbit and the steel bar was struck. The rabbit was presented a further two times and Little Albert showed the same fear reaction. After this he was presented with the dog alone and then the dog with the steel bar being struck. Little Albert shook his head from side to side, whimpered and tried to crawl away.

All of the tests conducted so far were carried out on a mattress on a table in a small, well-lit room. To test whether the same response would be achieved in a different setting, Little Albert was moved to a large well-lit lecture room. He was placed on a table immediately below a skylight. Here he was presented with the rat alone, the rabbit alone, the dog alone and then



the rat alone for a second time. The first time he saw the rat he held his hands away, but did not show a fear response. He had a slight fear reaction to the rabbit, and turned away from the dog and cried. The second time the rat was presented alone, he had a slight negative reaction, so Watson and Rayner presented the white rat and the steel bar to refresh the response. Little Albert jumped violently. When the rat was presented alone Little Albert did not react until the rat was moved closer. Little Albert began to whimper and raised his hands. He was then presented with the rat alone and then the rabbit and dog. Little Albert whimpered and drew his body away from the rat and whimpered and fell backwards when presented with the rabbit. He did not cry when the dog was presented, but when it barked loudly it caused him to fall over and cry.

So far Little Albert had shown a fear response tested over a period of less than a week, so he was left for a longer period before being tested again to see if the response persisted.

At the age of one year and 21 days, Little Albert was presented with a Santa Claus mask, followed by the seal fur coat, the rat, the rabbit and the dog, with the wooden blocks presented between each presentation. Little Albert withdrew from the Santa Claus mask and whimpered when he was forced to touch it. He wrinkled his nose at the fur coat and withdrew his hands from it. When he accidentally touched the fur coat he began to cry, and he whimpered when the fur coat was placed on his lap. When the rat was presented he sat very still. The rat then touched his hand and Albert withdrew it and leaned back away from the rat. The rat was then placed on Little Albert's arm and chest, making him fret and cover his eyes with both hands. Little Albert did not try to avoid the rabbit at first, but after a few seconds he puckered his face and began to push the rabbit away with his feet. After a minute he tried to reach out for the rabbit. The rabbit was placed on his lap twice and Little Albert shuddered and began to suck his thumb. When the dog was presented close to him, Little Albert cried and covered his eyes with his hands.

### WIDER ISSUES AND DEBATES

#### Ethical issues

Watson and Rayner were aware that their research could cause harm, and Watson notes a considerable reluctance in deliberately conditioning a fear reaction experimentally. Little Albert was selected because he tended to not show extreme emotions, and barely cried. It was this character that could have made him more resilient and less prone to the distress that would be involved in the conditioning trials. This, however, does not make the experiment any more ethical as the infant endured many conditioning trials where his fear reaction was strengthened over time. His mother withdrew him from the experiment before he could be deconditioned, so it is possible to speculate that the child spent his life with a phobia of white rats. However, theoretically, as it took so many conditioning trials for Little Albert to develop his fear, it is likely that his reaction would not have persisted for any significant length of time in his life. It is also known that Little Albert died young from a childhood illness.

### SKILLS

INTERPRETATION, INNOVATION,  
SELF-DIRECTION

### ACTIVITY 2

Draw a classical conditioning diagram to show how Little Albert was conditioned to fear the white rat. (Some examples of classical conditioning diagrams are given on page 229.)

### LINK

Refresh the key terms relating to classical conditioning on page 228.



## CONCLUSIONS

The study confirmed that a phobia of an object that was not previously feared could be learned. If a neutral stimulus (in this case, the white rat) is associated with an unconditioned stimulus (the loud noise of the steel bar being struck) which naturally triggers an unconditioned response (fear), successive introductions of the white rat together with a loud bang would lead to a stimulus association being formed. The presence of the rat (now a conditioned stimulus) resulted in fear (now the conditioned response). Stimulus generalisation was observed as Albert transferred his feared response to other animals and objects that were broadly similar to the white rat. In this study, Albert's fear response lasted for 31 days after the emotional tests were carried out, although the reaction became weaker towards the end. It was not possible to test Albert's fear response over a longer period of time, as he left the hospital.

Watson and Rayner concluded that an infant could be classically conditioned to develop a fear of a white rat. They also proposed that, since the fear reaction was present one month after the initial association, such conditioned emotional responses have the potential to last a life time. Objects similar to the feared stimulus can also elicit a feared response.

## EVALUATION OF WATSON AND RAYNER'S STUDY OF LITTLE ALBERT (1920)

Watson and Rayner's research makes a notable contribution to the understanding of the acquisition of human behaviours through the principles of classical conditioning. It also highlights the importance of the role of the environment in the shaping of our behaviour. Furthermore, a strength of Watson and Rayner's study lies in its scientific methodology. The researchers employed a degree of control in observing the stimulus-response link. For instance, they measured fear in Little Albert before the conditioning took place to act as a baseline comparison. They also conducted the study in another room to eliminate the effect of context as an extraneous variable; if they had not done this the researchers could not have been sure whether Little Albert was fearful of the white rat or just the room in which he was conditioned. Behaviours shown at every stage were carefully documented, ensuring potential replication. As a result of the methodology employed, the reliability of the study could be assured.

Many would criticise this study for a lack of ecological validity. This is because the location of study was largely a laboratory-like environment; in addition, the tasks given to Little Albert were not necessarily those that would be expected to confront him in normal everyday life.

Although ethical guidelines as we know them today did not exist at the time of Watson and Rayner's research, the study can still be criticised on ethical and moral grounds. It could be claimed that the psychological and the physical well-being of the Little Albert was neglected by the research because he was quite obviously distressed by the conditioning process and the researchers were unable to decondition his phobia. Fridlund et al. (2012) suggest that Albert was not as healthy as Watson described. They claim that Albert had suffered hydrocephalus since birth (an accumulation of cerebrospinal fluid in the brain) and presented a convincing argument that Watson knew about the child's condition. If Fridlund et al. are correct about Albert's health, this casts serious doubt over Watson and Rayner's findings and raises further ethical and moral questions about their approach.

A significant problem in generalising from the research is that the case study is of one individual child. One of the reasons why Watson and Rayner selected Little Albert as a research participant was for his unemotional character. Therefore, Little Albert may not be representative of individuals of the same age and gender and this could invalidate the findings.

Finally, the research could be criticised for cultural bias. Albert and the researchers themselves represent one culture (USA). This would have influenced their design of the study and their subsequent analysis of results. As a result, there is a question over the generalisability of their findings to other cultures.



**EXAM TIP**

You may be asked to explain how you would improve a study that you have learned about. Consider the weaknesses of the study and decide the most sensible weakness to improve. Make sure that you justify why your suggestion for improvement is a useful one.

**WIDER ISSUES AND DEBATES****Watson and Rayner and the nature–nurture debate**

One of the oldest debates in psychology surrounds the influence of environmental factors versus the influence of genetics in determining/constructing behaviour. Watson and Rayner's research is interesting in that we would assume there to be a natural feared reaction to hearing a loud noise – surprise. However the study shows that such a natural reaction can be adjusted, to become associated with certain items. This study therefore raises important questions with regard to the nature–nurture debate: might it be more productive to see behaviours through a composite explanation (an interaction) of both nature and nurture – rather than nature or nurture?

**CAPAFÓNS ET AL. (1998): SYSTEMATIC DESENSITISATION IN THE TREATMENT OF FEAR OF FLYING**

Juan Capafóns, Carmen Sosa and Pedro Averó aimed to validate the effectiveness of systematic desensitisation as a treatment for a fear of flying, and to assess the therapeutic success of systematic desensitisation when applied to this type of specific phobia.



A fear of flying is a common phobia ►



**AIM**

To investigate the effectiveness of systematic desensitisation as a treatment for a fear of flying.

**SAMPLE**

Participants were recruited for the study using a media campaign, which informed them of the opportunity to take part in a free-of-charge intervention programme aimed at treating fear of flying. In total, 41 participants came forward and 20 of these (eight males and 12 females) were randomly assigned to the treatment group (the group that would be subject to systematic desensitisation therapy). The remaining 21 participants (nine males and 12 females) were assigned to a control group (waiting for systematic desensitisation therapy).

**PROCEDURE**

Various diagnostic scales were used to assess participants' fear of flying:

1. Información Diagnóstica General sobre Fobia a Volar (IDG-FV: a Spanish general diagnostic information tool on the fear of flying). Questions in the IDG-FV allowed measurement of the patient's life history about aspects related to a fear of flying.
2. Fear of flying scales:
  - a) Escala de Miedo a Volar (EMV) a scale which measures the degree of anxiety perceived in different flight situations.
  - b) Escalas de Expectativas de Peligro y Ansiedad para el Miedo a Volar (EPAV-A and EPAV-B) both of which measure the frequency of catastrophic thoughts and the occurrence of different physiological reactions in a flight situation.
3. They also recorded heart rate, muscle tension and skin temperature.

Pre- and post-treatment comparisons were made on a selection of questions from each scale, to assess if any improvement in fear of flying was found following systematic desensitisation. These included:

- Answers to three questions from the IDG-FV: 1. How afraid of flying would you say you were? (not at all, a little, very, extremely). 2. Do you travel by plane when there is no alternative way to travel? ('I'm not afraid – I always fly'; 'Yes, but I get a little afraid'; 'Yes, but I get quite afraid'; 'Yes, but I'm terrified'; 'No, never'). 3. Whilst flying, have you ever had any of the following symptoms or feelings? (This contained a list of 21 items such as sweating, muscular tension, feelings of loss of control.)
- The three EMV scales: 1. Fear during the flight. 2. Fear of flight preliminaries. 3. Fear without involvement (such as seeing a plane flying).
- The two EPAV scales: 1. Catastrophic thoughts (e.g. fear of the engines catching fire). 2. Physiological anxiety.
- Heart rate, skin temperature and muscular tension during take-off in the simulation.

**KEY TERM**

**habituation:** the process by which a response to a given stimulus is seen to decrease with repetition

**SKILLS**

ADAPTIVE LEARNING,  
INTELLECTUAL CURIOSITY,  
SELF-DIRECTION

**LINK**

Hierarchy of fears is discussed on page 251.

**ACTIVITY 3**

Imagine that you are researching whether a fear of flying can be treated using systematic desensitisation. Develop a hierarchy of fears that you could use in your study.

All participants were interviewed individually and completed the IDG-FV. They later came back to watch a video of a plane trip (showing a person from the time she packed her case to her arriving by plane at her destination). Just before watching the video there was a **habituation** session involving a period of time during which the participant could become acquainted with the situation. It was here that the participants' heart rate, temperature and muscular tension were measured for a period of three minutes prior to the showing of the video. The participants were asked to 'feel as involved as possible' in the video.



## KEY TERM

**progressive muscle relaxation:** in each session the therapist focuses the client on tensing and relaxing one particular muscle group to create awareness of tension and relaxation

At the end of the video, an interview appointment was made for presenting the treatment to be followed (in the case of the treatment group), or for the next assessment session (in the control group subjects). In both cases the interval between the pre- and post-test sessions was approximately eight weeks. For the treatment group this involved two one-hour sessions a week with between 12 and 15 sessions in total. The session used traditional training techniques of breathing, **progressive muscle relaxation** and imagination. The treatment combined in vitro (imagined situations) and in vivo elements (exposure to real-life situations). It systematically used the technique of stop thinking and of brief relaxation in natural situations where the phobic stimulus was present. After eight weeks, the treatment and control group were invited back to take the questionnaires and simulated video test again.

## RESULTS

Table 24.1 shows three different measures taken before and after systematic desensitisation (or no therapy) in the treatment and control groups. Before any treatment began, the scores between both groups were fairly similar, suggesting that there was little difference between them and that they were a fairly homogenous sample.

TABLE 24.1: SOME OF THE PRE AND POST-TEST RESULTS COMPARING THE TREATMENT AND CONTROL GROUP ON THEIR RESPONSES FOR EACH SCALE AND THEIR PHYSIOLOGICAL RESPONSES

Mean (SD)	Pre-test		Post-test	
	Treatment condition	Control group	Treatment condition	Control group
Fear during flight EMV Scale	25.6 (4.2)	26.05 (3.67)	13.25 (7.97)	25.81 (4.8) $p < 0.001$
Catastrophic thoughts EPAV Scale	10.30 (4.17)	9.76 (4.92)	5.0 (2.64)	9.67 (5.61) $p < 0.01$
Objective physiological measures: heart rate	1.04 (0.09)	1.07 (0.1)	0.99 (0.04)	1.31 (0.09) $p < 0.01$

$p < 0.01$  indicates that the likelihood of the difference in pre and post test scores being due to chance are less than 1%;  $p < 0.001$  indicates that the likelihood of the difference in pre and post scores being due to chance is less than 0.1%

For the control group the 'mere passing of time' without any form of treatment did not lead to any reduction in the participants' assessment of their own fear of flying or objective measures of arousal. Yet for the treatment group (with the exception of two participants) there was significant arousal reduction in the participants' self-reporting of their levels of fear as well as in objective physiological measures.

Of the scores they obtained using the scales and objective physiological measures, they found that there was a significant reduction in fear measures following systematic desensitisation; many of these changes were highly significant. In fact, only ten per cent of those treated with systematic desensitisation showed no significant reduction in fear measures.

## CONCLUSIONS

Capafóns et al. concluded that given the lack of improvement in the control group and the significant improvement of the experimental group, systematic desensitisation is an effective treatment for decreasing or eradicating fear of flying. He noted, however, that systematic desensitisation is not infallible given that ten per cent of participants were incorrectly classified. This suggests that future research should look at why the therapy was successful and why it was more or less successful in certain patients.



**EXAM TIP**

In your exam you could be asked to analyse data and draw conclusions about significance. It is important to remember that 'not significant' does not mean that no difference was found, in this case between pre- and post-test analysis. It just means that there was a five per cent greater likelihood that the results were due to chance.

You also need to consider what 'difference' is being investigated. If the analysis you make on data presented in your exam suggests no significant difference between two therapies, for example, it suggests that the therapies had a similar success rate. Students often mistake 'non-significant' findings as being worthless findings. This is sometimes not the case; you need to examine what the difference being examined is before making a judgement. If, for example, one therapy is cheap and one is expensive, a non-significant difference between them could help health authorities direct resources to the cheaper therapy if there is no difference in terms of effectiveness.

**EVALUATION OF CAPAFÓNS ET AL. (1998)**

A strength of this study is in its application of a scientific method of assessment. Measures of fear and anxiety were achieved through quantifiable data, such as the use of scales to assess fear of flying, and objective measures such as heart rate and body temperature to determine the fear response; many of these scales were also validated for reliability.

The use of a control group is also advantageous as it acts as a baseline comparison between the two groups. This allows researchers to analyse differences between the groups in terms of the dependent variables and test for statistical significance, giving the researchers more confidence in their overall findings.

Undertaking the research within a consistent, laboratory-based environment meant that every participant experienced the initial stages of the study in the same way. Such standardisation in procedure would minimise the effect of any extraneous variables affecting the study. Of enormous benefit is the practical application of the findings. If participants benefit significantly from the therapy then this would suggest it should be offered as one of the main methods for treating fear of flying. Such treatment can bring significant personal, social and economic benefits as individuals are not prevented from flying on business or to visit distant friends or family members.

The study is somewhat limited due to the small sample size of 41 people. This causes a problem of generalisability: an ability to apply conclusions from the study to a wider population. To address this issue, researchers could increase the size of the sample in future and perhaps look for consistency of findings with other groups of participants, possibly in other regions or countries. In addition, one of the main methods for assessing fear of flying was conducted by means of interview questioning. This, while being quite a logical assessment, could be seen to limit the validity of the responses given. This is because techniques such as interviews rely on self-reporting (that is, a respondent stating their view/answer). Where, as in this study, closed-ended questions are used and especially where pre-set responses are given, as in the case of the IDG-FV system used in the study, respondents often choose a response that 'best fits' rather than accurately describing their view. Validity of response is limited, as the respondent's true view might not be 'best matched'.

The study also raises some ethical questions. While the control group offers useful comparisons, it is not acceptable to deny them the treatment. This ethical problem was lessened by the fact that the control group were placed on a waiting list for treatment.

**EXAM TIP**

You could be asked to give a strength or weakness of a study you have learned about in terms of a specific criteria; validity, generalisability, objectivity, reliability or credibility. Go back through your evaluation points for each study and categorise them into each criteria.



## PROT ET AL. (2014): LONG-TERM RELATIONS AMONG PROSOCIAL MEDIA USE, EMPATHY AND PROSOCIAL BEHAVIOUR

During recent years there has been a growing interest in the effects of prosocial media. Research suggests that prosocial media, such as video games and television, can encourage helping behaviour in real life. Furthermore, longitudinal studies have shown sustained increases in prosocial behaviour from prosocial media use. Understanding how prosocial media has such a positive impact involves understanding how we learn from and respond to it. This research set about trying to understand the mediating factors associated with prosocial media use, in particular whether prosocial media encourages empathy, which can lead to helping behaviour.

### SKILLS

SELF-REFLECTION,  
COLLABORATION, ANALYSIS

### ACTIVITY 4

To understand how empathy can be a possible mediating factor underlying the influence of prosocial media on helping behaviour, consider the television programmes you watch which may depict:

- acts of kindness or cooperation
- sharing the thoughts and feelings of others
- seeing characters we identify with showing empathy towards others
- watching characters feel positive emotions or gratitude for helping others.

In pair discuss how watching these programmes may encourage you to adopt more empathy for others. Choose a programme you watch and identify three ways in which the programme encourages prosocial behaviour.

### STUDY ONE

The researchers hypothesised that greater prosocial media use would be associated with more frequent helping behaviour, and that this association would be explained by empathy.

#### Aim

The researchers aimed to investigate the association between prosocial media use, empathy and helping behaviour across seven different countries. They also wanted to investigate the impact of age, gender and culture as variables likely to influence the strength and nature of empathy and prosocial behaviour on those who use prosocial media.

#### Sample

Participants were gathered from seven countries including Australia ( $n = 462$ ), China ( $n = 203$ ), Croatia ( $n = 438$ ), Germany ( $n = 200$ ), Japan ( $n = 395$ ), Romania ( $n = 233$ ), and the USA ( $n = 307$ ). In total 2202 adolescents and young adults were recruited, with a mean age of 21 years ( $SD = 5.6$ ). A cross-sectional analysis was conducted.

#### Procedure

Participants answered a questionnaire either online or face to face on media use by trained interviewers. Participants had to list their three favourite television shows, three favourite movies and three favourite video games, giving ratings of how frequently they watched/played it in a month. Participants were also asked to rate their listed television shows and movies for prosocial content and for violent content. They were also asked to rate their listed video games for prosocial and violent content using the items:

- 'How often do characters help each other in this game?'
- 'How often do you help others in this game?'
- 'How often do characters try to physically injure each other in this game?'
- 'How often do you try to physically injure players in this game?'



Empathy was measured by taking an average score of 14 items from the empathic-concern and perspective-taking subscales from the Interpersonal Reactivity Index. An example item on this index is 'Before criticising somebody, I try to imagine how I would feel if I were in their place'. It was assumed that empathy was a stable personality characteristic. Prosocial behaviour was measured using ten items from the Brief Prosocial Scale. An example item on this scale is 'I try to be helpful to people even if I don't expect to see them again'. Participants also answer questions on their gender, age, race, educational level, socioeconomic status and parent education.

## Results

TABLE 24.2: THE MEAN SCORES FOR VIOLENT AND PROSOCIAL MEDIA USE, EMPATHY AND HELPING BEHAVIOUR

	Australia	China	Croatia	Germany	Japan	Romania	USA
Prosocial media use	110.2	91.07	62.27	61.29	93.94	66.57	74.28
Violent media use	82.0	52.07	52.07	38.13	58.80	43.84	70.40
Empathy score	4.64	3.69	3.41	3.77	3.46	3.42	3.63
Helping behaviour score	5.17	5.09	4.89	5.33	4.92	4.88	5.01

Race, educational level, socioeconomic status and parental education were not significantly associated with media use or helping behaviour, so these variables were not analysed further. Across all seven countries there was an association between prosocial media use and helping behaviour with empathy as an influencing variable. This suggests that prosocial media may affect helping behaviour through changes in empathy made by watching prosocial media.

## STUDY TWO

Study one allowed the researchers to find a relationship between prosocial media-use and prosocial behaviour, however no causal conclusions could be drawn from the cross-sectional design. Therefore study two focused on establishing firm causal conclusions using a longitudinal design.

### Aim

The researchers wanted to investigate the relationship between prosocial and violent media-use, empathy and helping behaviour in a longitudinal study of children and adolescents.

### Sample

The first sample of the three measures consisted of 3 034 children and adolescents from Singapore (73 per cent male, 27 per cent female). The samples were recruited from six primary schools and six secondary schools (mean age = 11.2 years). The second sample consisted of 2 360 participants and the third sample consisted of 2 232 participants.

### Procedure

Questionnaires were administered to the students via their class teacher three times over a period of two years. Participants were asked to list their three favourite video games and how long they spent playing the video games during the week and on weekends. The frequency of use was rated by the children on a 16-point rating scale ranging from none to more than ten hours each usual week/weekend. The children were then asked to rate the frequency that their listed video games contained violent and prosocial themes on a four-point scale. For example, one prosocial item asked children to rate 'How often do you help others in this game?', and a violent item asked children to rate 'How often do you shoot or kill creatures in this game?'. The children rated each game from 0 indicating 'never', to 4 indicating 'almost always'.

Empathy was assumed to be a stable characteristic and measured using The Children's Empathic Attitudes Questionnaire. An example item from this questionnaire is: 'I would feel bad if my mother's friend got sick'. Helping behaviour was measured using subscales of the



Prosocial Orientation Questionnaire. An example item from this questionnaire is: 'I would spend time and money to help those in need'. The researchers also recorded the gender, age, race, socioeconomic status, education level and parental educational level for each child.

## Results

TABLE 24.3: THE MEAN SCORES FOR MEDIA USE, EMPATHY AND HELPING BEHAVIOUR

	Data collection points over two years		
	First data collection point: Time 1	Second data collection point: Time 2	Third data collection point: Time 3
Prosocial media use	1.34	1.28	1.35
Violent media use	1.39	1.27	1.15
Rated time spent playing video games	3.53	1.27	1.15
Empathy score	2.23	2.23	2.33
Helping behaviour score	3.05	3.05	3.05

The use of prosocial video games at Time 1 had a positive indirect with prosocial behaviour at Time 3 through empathy at Time 2. Violent video game use at Time 1 had a negative indirect effect on prosocial behaviour at Time 3 through its effect on empathy at Time 2. These results suggest that the use of prosocial video games was related to an increase in empathy, which explained later helping behaviour. The use of violent video games was related to a decrease in empathy, which explained lower helping behaviour later.

## CONCLUSIONS

Both study one and study two show that prosocial media use is positively correlated with prosocial behaviour in real life. The key to this relationship was empathy. Study two found both long-term positive effects of prosocial media use and long-term negative effects of violent media use, again this was mediated by changes in empathy.

The researchers also drew conclusions about media use generally. Both study one and study two demonstrate that the more time spent using media, regardless of its content, the less prosocial behaviour was shown by the children; this was also mediated by empathy. The researchers suggest that when children spend more time using media and less time interacting with others, this leads to less social interaction whereas empathy for others can be learned.

## EVALUATION OF PROT ET AL. (2014)

Prot relied heavily on the use of self-reporting methods to gather information about media use. Participants had to rate how often they helped or harmed others in the video games they played, so there may be social desirability, as the participants may lie and say they help others or did not harm others on video games more than they do to make themselves look good, so reducing the validity of the results. This means that we cannot be certain about the relationship between media use and prosocial behaviour. However, the ratings gathered from participants produced quantitative data which can be objectively analysed by the researchers. This means that comparisons can be easily made across the sample and conclusions can be drawn using statistical analysis.

There are both strengths and weaknesses about the samples that Prot et al. recruited. Study one used a very large sample of 2202 participants from seven different countries. This allowed the researchers to make cross-cultural comparisons between these countries and conclude that prosocial media had a general prosocial influence. However, study two only used participants from Singapore, so the culture studied could have had an impact on the results obtained. This may mean that the results are not representative of the effects of video gaming on children from other countries.



Both study one and study two show short-term and long-term effects of media use, specifically that the effects of prosocial and violent media use accumulate, bring about lasting changes in empathy and helping behaviour. This finding has been replicated by Brian Harrington and Michael O'Connell (2016) who found that prosocial video game use could develop empathic concern and prosocial behaviour in children as reported by teachers. This shows that the results of Prot et al.'s research can be considered reliable. A further strength is that the researchers used reliable inventories; for example the Interpersonal Reactivity Index was used as a measure of empathy, which is a commonly used self-report inventory known to have internal reliability and construct validity. It also means that the study can be repeated by other researchers using the same commonly used empathy measure to check for consistent results.

A further strength of Prot et al.'s findings is that they demonstrate the power of the media in influencing behaviour. They demonstrate the negative effects of violent media and the positive effects of prosocial media, which can be used by parents to make informed choices about what forms of media they allow their children to access. Also at a societal level, policymakers and media corporations can use this information to inform what media should be censored or encouraged to develop the kind of citizens we want for our future.

### **BASTIAN ET AL. (2012): CYBER-DEHUMANIZATION: VIOLENT VIDEO GAME PLAY DIMINISHES OUR HUMANITY**

The negative effects of violent video games have been well documented (Anderson and Bushman, 2001; Dill, Brown and Collins, 2008; Anderson et al., 2010). But before 2011 it had not been so well documented whether violent game play could have dehumanising effects on those who played the games. Brock Bastian, Jolanda Jetten and Helena Radke wanted to investigate to what extent the games affected participants' perception of their own humanity as well as that of their co-players.



Playing video games is a common pastime and could result in a change in perception of others



## STUDY ONE

To investigate whether playing violent video games has dehumanising consequences with regard to oneself and others.

### Aim

Study one aimed to investigate the effects in a violent video game context where players were being violent towards each other.

### Sample

Using *Mortal Kombat* as the violent game, and *Top Spin Tennis* as the non-violent video game, 106 participants (74 women and 32 men) were randomly assigned to either the violent or non-violent condition. Participants were undergraduate students aged between 17 and 34 years of age.

### Procedure

Participants played a two-player game for a period of 15 minutes with a dividing wall between players so they could not see each other or be affected by another's game playing. Initially, 52 participants played the violent game *Mortal Kombat*, and 54 participants played the non-violent game *Top Spin Tennis*. Participants were then given a questionnaire to complete. The questionnaire included questions concerning how enjoyable the game was, how exciting and how frustrating it was. The questions were framed using a 1 to 7 Likert-type scale rating.

Using a separate scale, participants were asked to assess their own level of 'humanness' on eight questions. Four questions assessed their human nature (e.g. 'I felt that I was emotional, like I was warm and responsive'), and four items assessed human uniqueness (e.g. 'I felt like I was refined and cultured'). Participants also rated their opponent on the same items (e.g. 'I felt like the other person was warm and responsive'). Specifically the participants were instructed to answer the questions in relation to how they 'experienced the game' and how they saw themselves and their opponent as possessing these characteristics.

### Results

They found that participants in both conditions found the games equally frustrating, but *Mortal Kombat* was rated as more enjoyable and significantly more exciting. They also found that the mean score for self-humanity was lower in the violent game condition (3.74) than the non-violent game (4.35), and mean score for others' humanity lower in the violent game condition (4.43) compared to the non-violent game (4.93). Even when factors such as gender, enjoyment and frustration were accounted for in their analysis, the findings were still statistically significant.

### Conclusion

Bastian's predictions about the effects of violent games on perceptions of humanity were confirmed. He found that playing a violent game, as opposed to playing a game with little or no violence, resulted in reduced perceptions of an individual's humanity as well as that of their opponent.

## STUDY TWO

While the first study showed clear links between video game violence and dehumanised perceptions of oneself and of an opponent, Bastian felt that several questions remained unanswered. Firstly, the characters in *Mortal Kombat* are clearly not human. Could it have been that reduced levels of humanness were reported because the participant simply saw themselves as another character in the game? Or was it that simply the act of placing a person in a situation of conflict against another leads to a reduction in our perceived level of humanity?

### LINK

Likert scales are discussed on pages 37–38.



Could playing the game actually induce the participant to view themselves negatively (that is, they feel bad after playing the game) and thus negatively assess themselves after the game?

### Aim

The second study aimed to overcome the limitations of the first one and seek answers to these questions. The researchers aimed to investigate whether playing violently against computer avatars rather than a human opponent had any effect on self-perception of humanity.

### Sample

Participants recruited were 38 undergraduate students with a mean age of 20.18 years; ten were male and 28 female, who took part for course credit or a US \$10 payment.

### Procedure

Participants were randomly assigned to the *Call of Duty 2* condition or the *Top Spin Tennis* condition. Participants played the games not as opponents but as co-players against a computer avatar. The screen was split into two halves so that the participant could see their own viewpoint and also see the avatar's viewpoint.

After playing they were then asked as before how frustrating, enjoyable and exciting the game was. They then had to rate themselves and the other person on the same measure of humanity as used in the first study, specifically focusing on their own experience of the video game, and then the view of the other person. The self-esteem and mood of the participants was also measured to ensure these variables did not affect the results. Self-esteem was measured using the State Self-Esteem Scale. This included questions about their perception of confidence in their abilities and whether they felt they were respected or admired. Mood was measured using the 20-item PANAS (Positive and Negative Affect Schedule). This schedule is designed to test participants' feelings, such as the extent to which they feel 'upset', 'excited', 'guilty', etc.

### Results

TABLE 24.4: MEAN SCORES FOR SELF-HUMANITY AND OTHER HUMANITY

Type of video game	Mean score for self-humanity	Mean score for other humanity
Violent	3.82	4.89
Non-violent	4.48	4.86

Study two shows that the playing of a violent game did reduce a person's own self-reported perception of their humanity when playing both first-person shooter games and acting collaboratively rather than against a co-player. The study further illustrated that engaging in violent games does not necessarily make us feel bad, or see ourselves more negatively, but it might affect how 'human' we feel. Indeed the simple playing of a violent game also does not affect our perception of the humanness of others – this is only affected when the other person is an opponent and not a co-perpetrator. The study indicated that there are many variables needing to be accounted for in understanding the complex effect of video games and dehumanisation, and that future research in this area will add weight to the conclusions.

### Conclusion

The researchers concluded that playing a violent video game reduces perception of our own humanity, even if the opponent is an avatar. They also concluded that playing violent games does not make us feel bad or see ourselves in a more negative light; it only affects how human we feel.



This research has provided a way to understand the effects of violent games on behaviour, our emotions and the way we think. This is empirical evidence that people might see themselves as less human when playing violent video games.

Thus the Bastian et al. study contributes further to previous research in the area on dehumanisation, and as people increasingly spend longer periods of time playing online games the likelihood and possibility of such experiences dehumanising the players is greater. This could suggest that repeated exposure to such dehumanising experiences might result in radical changes in self-perception and perception of others.

### EVALUATION OF BASTIAN ET AL. (2012)

The Bastian et al. study very clearly has real-world application. Computer gaming is very popular, and with computer animation becoming ever more realistic, and the consoles becoming more affordable, questions need to be asked about the effects of gaming on behaviour. This is because the study contributes to a widely held and heated debate on the effects of violent computer games and particularly the effects that prolonged exposure can have on its audience, especially children. Studies like this have led to and helped justify the use of age certification of games.

Furthermore, the Bastian et al. research results concur with previous research in the area on the video game effect. Studies conducted by notable authorities such as Anderson and Bushman (2001), Anderson, Gentile and Buckley (2007), and Anderson and Bushman (2007) all show negative impacts and effects on behaviour through video gaming. As a result, this adds to the academic impetus of the present research of Bastian et al. and his unique drive to examine dehumanisation in this process, which had not been examined previously.

A problem with concluding that video gaming causes dehumanisation of self and others is that the participants playing the games were actually also victims of game violence, either by another player or by a game avatar. It is perhaps because they were victims that the scores of self-humanity were reduced following playing the violent games.

This study was ethically appropriate on many grounds. This is because individuals were fully informed in their decisions to take part; the study itself used limited if any deception, and the research team illustrated their competence as researchers throughout. As a result, the research ensured that the moral standards expected in psychological research are maintained.

However, the Bastian et al. research illustrates problems of generalisability because the study used a small and biased sample. Between the two studies, the majority of subjects were women. As a result it is arguable that this gender bias (gynocentric result) might produce findings that are not globally representative of a typical computer gaming population. Furthermore, questions of validity can be raised with Bastian's research, such as with the rating scales that the researchers used. Bastian himself admits that participants might have been compelled to rate themselves less human or more negatively given the context in which they were studied. However, participants indicated that they did not suspect that the research concerned a link between video game violence and dehumanisation.

### SKILLS

#### ETHICS, SELF-DIRECTION

### ACTIVITY 5

Rank each study on a scale of 1–10 for ethics (1 = most ethical and 10 = least ethical). Write notes to justify your ranking:

- Watson and Rayner (1920)
- Capafóns et al. (1998)
- Prot et al. (2014)
- Bastian et al. (2012)



**WIDER ISSUES AND DEBATES****How psychological understanding has developed over time**

The Bastian et al. study illustrates clearly (as do other related pieces of research in the area) that gaming does have an effect on individuals, and this study specifically suggests that gaming would seem to lead to a reduction in the way in which we rate our humanness. Although computer games have been available in basic forms for 20 to 30 years, it is really only in the last ten years that consoles have been produced with increasingly life-like forms and perspectives.

It was not a focus of psychological interest 40 years ago but gaming is now at the forefront of psychological research. Psychology therefore cannot be a static science, but one that changes with the ebb and flow of social behaviour and interest. As gaming becomes an ever-popular pastime for individuals, psychologists must continue to research into the potential effects on users. A better knowledge of the effects of gaming can lead to a fruitful discussion of how to change and develop them in the future.

**SKILLS**

PROBLEM-SOLVING, CRITICAL  
THINKING, ANALYSIS

**CHECKPOINT**

1. Identify which study the following samples belong to:
  - a) 41 participants were recruited from a media campaign
  - b) 2 202 adolescents and young people participated
  - c) One nine-month old male child was chosen for being stolid and unemotional
  - d) 106 undergraduate participants were recruited
2. Watson and Rayner (1920) were investigating whether they could condition a phobia of what stimuli?
  - a) A loud noise
  - b) A small well-lit room
  - c) A white rat
3. Watson and Rayner (1920) found that Little Albert showed stimulus discrimination because:
  - a) he cried at the Santa Claus mask
  - b) he played nicely with the wooden blocks
  - c) he was afraid of the furry rabbit
4. Capafóns et al. (1998) was investigating the effectiveness of which treatment as a fear of flying?
  - a) Psychoanalysis
  - b) Behaviour shaping
  - c) Systematic desensitisation
5. How many sessions of treatment per week did participants in Capafóns et al. (1998) study have?
  - a) Two one-hour sessions
  - b) One two-hour session
  - c) One one-hour session



## SKILLS

## ETHICS, EVALUATION

## EXAM PRACTICE

1. In your studies of learning theories and development you will have studied one of the following contemporary studies in detail:
  - Prot (2014)
  - Bastian et al. (2012)State one aim from the contemporary study you have chosen. (1 mark)
2. Watson and Rayner (1920) used classical conditioning in their study on Little Albert.
  - a) Identify the unconditioned stimulus (UCS) in Watson and Rayner's (1920) study. (1 mark)
  - b) Explain two ethical weaknesses of Watson and Rayner's (1920) study. (4 marks)
  - c) Explain one improvement that could be made to the sample used in Watson and Rayner's (1920) study. (2 marks)
3. Evaluate the contemporary study by Capafóns et al. (1998): Systematic desensitisation in the treatment of the fear of flying. (8 marks)



# CHAPTER 25 PRACTICAL INVESTIGATION

## LEARNING OBJECTIVES

By the end of this chapter you should be able to:

- design and conduct two observations or one observation which gathers both qualitative and quantitative data, on an aspect of learned behaviour
- make design decisions when planning and gathering data, including the use of behavioural categories, coding sheets and tallying, control, hypothesis construction, ethics and observer bias/effects
- collect and present and comment on data gathered, including descriptive statistics and graphical representation
- analyse data using a chi-squared statistical test and explain the significance of the result
- conduct a thematic analysis on the qualitative data gathered and describe the findings
- consider strengths and weaknesses of the observation(s) and possible design improvements
- write up the procedure, results and discussion section of a report on your investigation.

## GETTING STARTED

We see behaviour every day, but an observation is more than simply seeing, it is the systematic collection of pre-defined behaviours. This involves a careful consideration of what behaviours would be expected in a given situation or for a specific study aim. Consider the following observation aims. What pre-defined behaviours would be expected in each scenario?

- Researchers aimed to investigate non-verbal communication patterns during job interviews.
- Researchers aimed to investigate classroom behaviour when teachers used different behaviour management strategies.
- Researchers aimed to investigate parent-child interactions during a preschool setting.

## DESIGNING AND CONDUCTING OBSERVATIONAL RESEARCH

For the practical investigation for this topic, you could do two observations – one to gather qualitative data and one to gather quantitative data. Alternatively you could do one observation, if both qualitative and quantitative data are gathered in the same observation. The observation should be made on a behaviour which has been learned, for example prosocial/antisocial behaviour, gender type behaviour, modelling others. It may be useful to review learning theories and consider what types of behaviour can be learned before you begin.

The following is a worked-through example of one observation which gathers both qualitative and quantitative data.

### OBSERVING GENDER DIFFERENCES IN BEHAVIOUR ON PUBLIC TRANSPORT

In this section, we will work through a practical example of an observational study of prosocial/polite behaviour in men and women on public transport such as a bus or a train. As we have seen in Chapter 15, Bandura suggested that children observing an aggressive role model will later model this antisocial behaviour. By conducting an observation you will be able to investigate whether social learning theory may also explain the modelling of more prosocial behaviours in society. Such prosocial behaviours may include holding open a door, or helping someone on to public transport.

#### LINK

Refresh your understanding of the different learning theories on pages 228–243.





▲ Prosocial behaviour is defined as any behaviour that is intended to benefit another

### Hypotheses

The aim of your research is to investigate gender differences in behaviours on public transport such as prosocial behaviours or politeness. In quantitative observational research, it is important that the prosocial behaviours you observe can be clearly measured. In formulating your hypothesis, you will need to decide whether to select a directional (one-tailed) or non-directional (two-tailed) hypothesis. Generally speaking, if researchers are unsure of the effect, they will use a non-directional hypothesis. If, however, they have an idea of which way the research will go, perhaps through the results of previous studies that have been done, then they will use a directional (one-tailed) hypothesis. Whatever hypothesis you choose, it is very important that it is clearly testable.

#### LINK

Directional and non-directional hypotheses are discussed in the section on cognitive methods on page 102.

### Background and links to learning theories

Social learning theory can be used to explain gender differences in society. It suggests that we learn gender-appropriate behaviours from the people around us, for example parents, teachers, siblings, peers and the media. These role models show us how to behave and also reinforce gender-appropriate behaviours through rewards and punishments. The theory can therefore explain stereotypes in society such as women being kind, helpful and perhaps being more polite and friendly to people on the whole. These behaviours may be modelled and rewarded in women more than men.

Eagly (2009) suggested that women and men both engage in prosocial behaviours, equally. However, women tend to engage in more communal and relational prosocial behaviours whereas men tend to display more agentic prosocial behaviours, meaning that men engage



in prosocial acts to gain status or to show their strength to others. Similarly, a study by Leslie, Snyder and Glomb (2013) examining workplace donations to charity suggested that women donated more than men. This may suggest that women will show more helpful and polite behaviours on public transport than men; for example, giving up a seat, helping with a pram/stroller, polite interactions with drivers and fellow passengers or making way for fellow passengers to squeeze through on a crowded bus.

Because the background literature and research on gender and prosocial behaviour is mixed, a non-directional (two-tailed) hypothesis will be put forward: there will be a difference in the number of women and men who display prosocial behaviour by thanking the bus driver before alighting.

### Planning an observation

In planning the quantitative aspect to your observation you will need to think about the statistical test that you will use later to analyse your data. In this instance, you have participants who are distinguished by category – male and female. They can only be in one of these categories so the data is unrelated.

Before conducting your observation you will have a few design decisions to make. You will more than likely be undertaking a naturalistic observation as you will be observing participants in a natural setting. You will need to decide when and where you will undertake your observations. This will include factors such as which bus or train route, the day of the week, the time of day and the duration of your journey. All of these factors will influence how many passengers there will be and the type of passenger travelling. This example practical observation will be a naturalistic observation of people on a bus, so the sampling technique used to recruit participants will be opportunity sampling.

### SKILLS

INTELLECTUAL CURIOSITY,  
SELF-DIRECTION, REASONING  
AND ARGUMENTATION

### ACTIVITY 1

In order to choose the type of observation you will use, it is important to weigh up the strengths and weaknesses of each. Review the different types of observation you learned about in Chapter 23. Copy the following table and summarise each type in terms of its value for your investigation in this chapter:

Type of observation	Strengths	Weaknesses
Structured		
Naturalistic		
Covert		
Overt		
Non-participant		
Participant		

You will also need to consider the type of behaviour you are going to observe. These are the behavioural categories. For instance, you may decide to measure polite behaviour by whether or not bus passengers thank the driver before alighting (see Table 25.1). Other behavioural categories could include assisting other passengers, giving up a seat or making way for others on a crowded bus. Once you have decided which prosocial behaviours are suitable to investigate on a bus journey, you will need to draw a chart so that you can tally each time a passenger displays such behaviour.



TABLE 25.1: EXAMPLE OF AN OBSERVATION RECORD/CODING SHEET

	Male	Female
Thanking the bus driver	I	III
Giving up a seat on the bus	II	
Helping a passenger with a pushchair	I	II

As you will be able to count up the instances of polite or prosocial behaviour occurring on your coding sheet, you will be able to tally the observations – this is quantitative data that can be tested for significance with an inferential statistical test.

Your observation should also gather qualitative data by writing down what you observed in more detail; for instance, what passengers actually said, or annotating your observations in more detail in your notepad about whether the bus driver was male or female, the age of participants and whether there was eye contact. You can then conduct a thematic analysis on your qualitative data.

### Pilot study

Before you conduct your observation, you may want to test it out via a pilot study to address any potential problems and test out your observational criteria. For instance, where is the best position to observe behaviours? If you are observing interactions with the driver, it's a good idea to sit closer to the front. You may want to see how long the journey needs to be to give you enough data. At busy times, such as rush hour, can you observe everyone?

A pilot study is not used to test whether an investigation is valid or reliable – it is only used to check that apparatus, timings, and so on work correctly. A pilot study is a useful opportunity to ask participants whether they felt uncomfortable, suspected anything was going on or felt their behaviour was influenced in any way.

### Controls

You might want to consider recruiting someone to help you, for example with one of you observing male passengers and the other observing female passengers. You would, however, need to consider factors such as inter-rater reliability (the degree of agreement between two or more observers) to ensure you are both being consistent in your observations and to control for observer bias. Your observation is likely to be covert (participants are unaware they are being observed) but it could be worth checking if passengers pay attention to your note taking and become suspicious, which could pose a confounding variable for your observations.

### Ethical considerations

Observations in public places are considered an ethical place to observe people because you might well be expected to be observed by others in your day-to-day interactions. This would include public transport, such as buses and trains. As you are not collecting names or any other personal data, only the gender and the observed behaviour, you will not be contravening ethical guidelines. You might wish to gain consent from your participants once the observation is complete; however this may not be practical.



## SKILLS

INITIATIVE, RESPONSIBILITY,  
SELF-REGULATION

## ACTIVITY 2

Copy the following table and write a summary of your design decisions so far.

Design decisions	Summary
Type of observation chosen	
Directional or non-directional hypothesis	
Controls	
Qualitative data	
Quantitative data (behavioural categories)	
Ethical considerations	

## ANALYSING QUANTITATIVE DATA

Once the planning of the observation has been done, the observation can be conducted. This practical investigation example has collected the data on an hour's bus journey between 3.00 p.m. and 4.00 p.m. on a Thursday. In all, 51 passengers were observed – 24 women and 27 men. It tallied the number of males and females on whether they thanked the bus driver not.

You could present your data as shown in Table 25.2 in preparation for a chi-squared test.

TABLE 25.2: FREQUENCY OF PROSOCIAL BEHAVIOUR SHOWN BY MEN AND WOMEN ALIGHTING FROM THE BUS

	Men	Women	Total
Thanked the bus driver	11 (cell A)	18 (cell B)	29
Did not thank the bus driver	16 (cell C)	6 (cell D)	22
<b>Total</b>	<b>27</b>	<b>24</b>	<b>51</b>

Table 25.2 shows that 11 men and 18 women thanked the bus driver when alighting, whereas 16 men and 6 women did not thank the driver on alighting. This is known as a two-by-two contingency table, which is suitable for nominal data.

## MATHS TIP

This practical example has collected nominal level data, so a bar graph is the most appropriate graphical representation of the results. You will need to consider the level of measurement of the data collected in order to establish which type of graphical representation is best to use to illustrate your findings.

From analysing the table, you will see that there is a fairly equal frequency of male and female participants observed on the bus journey. There is also a small difference in the number of male and female passengers who thanked the driver. To determine whether the difference in prosocial behaviour is significant or just due to chance requires a statistical test.



## SKILLS

ANALYSIS, ADAPTIVE LEARNING,  
CREATIVITY

## ACTIVITY 3

Once you have conducted your observation, draw a bar graph to represent the data collected. Remember to label the title and axes fully and provide a key where necessary.

## LINK

Bar graphs are explained in the section on social methods on page 50.

## CARRYING OUT A CHI-SQUARED TEST

The chi-squared test is the most appropriate statistical test in this circumstance as the study is predicting a difference, it is using unrelated data/independent groups and we have nominal level data.

## LINK

To refresh your understanding of the chi-squared test, go back to Chapter 23.

The following procedures apply to conducting a chi-squared test:

1. You first need to calculate the expected values against the observed values. The observed values are the ones in our contingency table – 11, 18, 16, 6. The expected values need to be calculated for each cell in our table by working out how the data would be distributed if there were no differences in the pattern – that is, no difference between males and females in thanking the bus driver. This is done by using the totals for each row or column.

$$\text{Expected value (E)} = \text{row total} \times \text{column total} / \text{overall total}$$

Cell	$E = \text{row} \times \text{column} / \text{total}$
A	$29 \times 27 / 51 = 15.35$
B	$29 \times 24 / 51 = 13.65$
C	$22 \times 27 / 51 = 11.65$
D	$22 \times 24 / 51 = 10.35$

2. You will now need to take the expected value ( $E$ ) from the observed value ( $O$ ) for each of the cells and square the result. Then you divide that result by the expected value ( $E$ ). Finally add the four results to find the overall chi-squared result.

Cell	
A	$(11 - 15.35)^2 / 15.35 = 1.23$
B	$(18 - 13.65)^2 / 13.65 = 1.39$
C	$(16 - 11.65)^2 / 11.65 = 1.62$
D	$(6 - 10.35)^2 / 10.35 = 1.83$
Total	$= 6.07$

3. Find the critical value for chi-squared by first calculating the degrees of freedom (df). This is done by multiplying (rows – 1)  $\times$  (columns – 1) of your table. In our two-by-two contingency table, this means our df is  $(2 - 1) \times (2 - 1) = 1$



**MATHS TIP**

Because nominal data is used for a chi-squared test, we do not have information about individual scores as for other statistical tests. Therefore we do not have an ' $n$ ' column (number of participants) on the critical values table. This is why we need to calculate degrees of freedom instead. You will notice that instead of an ' $n$ ' column on the left-hand side of the critical values table, a chi-squared has a ' $df$ ' column.

4. Compare the overall observed value against the critical values table. For a non-directional/two-tailed hypothesis, with  $df = 1$ , the critical value at a significance level of ( $p < 0.05$ ) is 3.84. As the observed value of (6.07) is greater than the critical value in the table (3.84), the result is significant and the null hypothesis can be rejected. This means that there is less than a five per cent probability that the difference in prosocial behaviour displayed by males and females is due to chance. The direction of this difference can be established by examining the cells/totals. In this case, females travelling on the bus were more likely to thank the bus driver and males were not.

		Level of significance for a one-tailed test					
		0.10	0.05	0.025	0.01	0.005	0.0005
df	Level of significance for a two-tailed test						
	0.20	0.10	0.05	0.025	0.01	0.001	
1	1.64	2.71	3.84	5.02	6.64	10.83	
2	3.22	4.61	5.99	7.38	9.21	13.82	
3	4.64	6.25	7.82	9.35	11.35	16.27	
4	5.99	7.78	9.49	11.14	13.28	18.47	
5	7.29	9.24	11.07	12.83	15.09	20.52	

5. The observed/calculated value must equal or exceed the critical value to be significant at the level shown.

**SKILLS**

## PROBLEM-SOLVING, ANALYSIS

**ACTIVITY 4**

Calculate the chi-squared value on your own observational data to find out if your results are significant or not.

Analyse the results of your chi-squared test at different levels of significance, for example  $p \leq 0.10$ ,  $p \leq 0.05$ ,  $p \leq 0.01$ . What difference does this make to the choice of your hypothesis?

**ANALYSING QUALITATIVE DATA**

Unlike quantitative data, qualitative data cannot be summarised in a chart or graph. Typically, the analysis of qualitative data involves recognising repeated themes. The technical term for this type of approach is thematic analysis. Braun and Clarke (2006) outline a five-phase approach to the structure of a thematic analysis as follows.

- **Phase one – Familiarisation with the data:** while on the bus journey, it was noted that when males and females thank the bus driver they do it in a different manner.



Example:

Male passengers were observed to say 'Thanks' or 'Thank you, driver'. They were also more likely to engage in 'small talk' with the driver before alighting, for example 'What time does your shift finish?'. Females, on the other hand, were more likely to say thank you followed by a simple departure greeting such as 'Goodbye' and were more likely to make eye contact with the driver when alighting. Therefore, you have begun to notice things or themes that might be relevant to the research question.

- **Phase two – Generating initial codes:** a label or a code is the given to any specific categories identified such as 'thank you, with familiarity', 'thank you, with no familiarity', 'departure greeting', 'small talk', etc.
- **Phase three – Searching for themes:** in this phase a researcher would seek out themes on the basis of initial labels/codes for some meaning. In our example, 'implied familiarity' could be one such category suggesting that passengers make 'small talk' with the driver.
- **Phase four – Reviewing themes:** here, the researcher tries out these categories. This could mean collecting another set of data to see if future observations fit within them. If the research suggests that it does, then this could mean it is a topic area for the researcher to investigate further.
- **Phase five – Defining and naming themes:** the researcher has clearly defined their themes, which allows them to select information and analyse it against the themes.

Finally, a report is produced in relation to the categories identified, which tells a story about the emerging themes identified.

Unlike quantitative data, qualitative data presents observations, thoughts, etc. that are not always easily counted. It does, however, provide much richer detail on the complexities of human interaction and behaviour. Nevertheless, it is sometimes difficult to select patterns and draw firm conclusions. Qualitative analysis is also more likely to be subjective, perhaps reflecting the personal viewpoints and background of the researcher.

## CONCLUSIONS

The outcome of the statistical test informs the overall conclusion of the observation. In this instance, the chi-squared test would suggest the results of the experiment are significant so the null hypothesis is rejected and the experimental hypothesis accepted that 'there will be a difference in polite behaviour observed by females and males alighting the bus'.

In drawing conclusions in relation to the qualitative data, you will need to look at the themes in the observation. You could also illustrate how themes are demonstrated by providing specific examples to support your interpretation. For example more 'small talk' was observed with the driver and male passengers, so you could provide specific quotes or observations to back this up.

## EVALUATING THE PRACTICAL INVESTIGATION

In evaluating your overall observational study you will need to consider its validity, reliability, generalisability and credibility.

### VALIDITY

In considering the validity of your observations you need to consider the setting in which they took place. Undertaking a naturalistic observation is real life and would suggest a certain degree of validity. You will also need to consider how objective or subjective your behavioural



categories are. In the case of observing 'thank you', this is a relatively objective measure as it does not involve any kind of judgement. Qualitative data on the other hand can reflect the personal view or interpretation of the observer. What is seen as 'small talk', for instance, involves more interpretation on the part of the observer.

One way of improving the validity of qualitative data is respondent validation. There are many different forms of respondent validation but one way of checking your interpretation of your results is to gain feedback from participants in your sample. This is difficult in naturalistic observation but a researcher could interview regular users of public transport to ascertain their views on the interpretation of results. This allows interviewees to cast a critical eye over the findings and comment on them in relation to their own opinions, feelings and experiences. If participants are generally in agreement then this affirms the validity of your interpretation.

Triangulation is another method for ascertaining reliability and validity of both qualitative and quantitative investigations. It refers to the use of more than one approach in the investigation of a research question. The use of a single research method may suffer from the limitations associated with that particular method. Triangulation offers the opportunity to check results and in doing so provides increased confidence in the findings if similar results are gained via other methods. A researcher may use a questionnaire with bus passengers to ascertain their views on politeness on public transport to see if they correspond with the behaviour observed by the passengers.

### **RELIABILITY**

How easy is it for you or another observer to repeat the study and would it lead to similar findings if the study was conducted on another bus, or in another town, or at another time of day? This can only be determined by repeating the observation numerous times and comparing the data. For qualitative data, reliability is harder to assess due to its subjective nature. However, inter-rater reliability and the test-retest method can be used. If there are two or more observers, inter-rater reliability gives a measure as to how much agreement there is between researchers when conducting an observation. If researchers are in agreement about the behavioural categories, and note similar observations in similar circumstances, this would suggest there is reliability. However, a lack of consensus may mean that the behavioural categories used may need to be revised to ensure reliability. Alternatively, in the test-retest method, a researcher could conduct the observation and then conduct it again a day, week or month later on the same bus route to see if similar results are achieved.

### **GENERALISABILITY**

In assessing if you can generalise from your observations you will need to consider your sample. The time of day at which you conducted your observations may affect the sample achieved. The ages of the participants also need to be considered. An equal distribution of ages within the sample will minimise bias. For instance, a larger proportion of retired people on the bus may result in a greater number of polite interactions being observed as such participants may be less time-pressured and hold more traditional values of respect and politeness.

### **CREDIBILITY**

Science would suggest that the credibility of the research is dependent on how the research meets the scientific principles mentioned earlier in the topic such as replicability, measurable phenomena, etc. At the very least, you should weigh up the overall strengths and weaknesses of



your study. On one hand, a naturalistic observation is a valid form of measurement. However, your observation is likely to be carried out at a certain time of day and therefore it will influence the sample achieved, which can pose potential problems when generalised to other populations and situations. A number of repeated observations may be required to assess its overall effectiveness.

Observations during rush hour may include more commuters in a hurry, so they may have less time for polite interactions



### IMPROVING YOUR PRACTICAL INVESTIGATION

When considering improvements to your practical investigation you could consider the following:

- Was the sample representative? If not, how could it be made more representative?
- Was the situation natural? If not, how could it be made to be more natural?
- Were there any issues with lack of control? What controls could be used?
- Were the behavioural categories measuring what was intended? How else could the behavioural categories be operationalised more effectively?
- Were any aspects of the data collection or analysis subjective? How could it be made more objective?
- Were there any unforeseen ethical issues? How could ethics be improved?



## SKILLS

## PROBLEM-SOLVING, ANALYSIS

## CHECKPOINT

1. You will have conducted a chi-squared test for your practical investigation and may also be asked to calculate this test in the examination or be asked to describe how you went about analysing the quantitative data from your observation to determine statistical significance. Put the instructions for conducting a chi-squared test in the correct order.
  - a) Subtract the expected value from the observed value. Then divide that result by the expected value to give an overall score for that cell.
  - b) Compare the calculated chi-squared value with the critical/table value to determine significance.
  - c) Calculate the expected values against the observed values using the formula 'expected value = row total  $\times$  column total/overall total'.
  - d) Total the overall scores for each cell to give the chi-squared value.
2. Which is the best descriptive statistic to summarise the quantitative data from your practical investigation?
  - a) Mean
  - b) Median
  - c) Frequency
3. Which is the best graphical presentation for you quantitative data from your practical investigation?
  - a) Scattergraph
  - b) Bar graph
  - c) Line graph

## SKILLS

## ANALYSIS, EVALUATION

## EXAM PRACTICE

1. In your studies of learning theories and development, you will have conducted a practical investigation.
  - a) Describe the procedure of your learning theories and development practical investigation. (4 marks)
  - b) Explain one strength of your learning theories and development practical investigation in terms of validity. (2 marks)
  - c) Explain one improvement you could have made to your learning theories and development practical investigation in terms of reliability. (2 marks)



# GLOSSARY

**ABC model of operant conditioning** a way of explaining how operant conditioning works, showing how the consequence of a behaviour influences the replication of behaviour

**action potential** the electrical trigger that passes along the axon and stimulates the neuron to activate and release neurotransmitters as a result of synaptic transmission

**adrenal glands** pair of small glands at the top of each kidney, which produce and release hormones such as cortisol, adrenaline and noradrenaline to help the body respond to stress

**adrenaline and norepinephrine** hormones that increase the heart rate, alertness and other functions in preparation to deal with threat

**affective disorder** disturbances in mood or emotion, such as depression

**agency** when we act as an agent for another, e.g. obey orders

**agonist** chemical substance (drug) that binds to and activates a receptor to cause a signal. When an agonist binds to a receptor it triggers a biological response which mimics a neurotransmitter

**alternative hypothesis** a prediction of the outcome of a study when conducting a study using a non-experimental method

**Alzheimer's disease** a neurological degenerative disease that impairs cognitive functioning causing memory loss and impairments in thinking and language

**androcentric** research representing a male point of view

**androgen** chemical that develops or maintains male characteristics

**angular gyrus** part of the parietal lobe associated with memory, language processing and attention

**antenatal** before birth

**anterograde amnesia** the loss of ability to make new memories, while memories before the injury remain relatively intact

**anterolateral** to the front and side of

**antisocial personality disorder** characterised by a lack of empathy and understanding of others, a disregard for social conventions, impulsivity and aggression

**aphasia** a disturbance in the comprehension or production of language caused by brain dysfunction or damage, such as a stroke

**attended information** sensory information that is given attention

**autonomy** acting on one's own free will/exercising self determination

**axon** branch from the cell body that passes electrical impulses down to the end of the neuron to allow it to communicate with others

**axon hillock** area that connects the cell body to the axon

**axon terminals** end of the axon that leads to the terminal buttons

**basal model** model that suggests the testosterone is assumed to be a persistent trait that influences behaviour

**behavioural economics** a field of study that combines psychology and economics to study how individuals make decisions

**bilateral** both hemispheres of the brain are involved

**brain stimulation** the use of electrodes to stimulate regions of the brain and examine resulting behavioural or cognitive changes as a result

**Broca's area** an area of the left (typically) frontal lobe associated with the production of language

**castrated** when the testicles of a male animal or a man are removed

**causality** the effect of the manipulated variable on the measured variable can be reliably established as a cause-and-effect relationship

**cell body** main part of the cell where the nucleus sits; it also contains mitochondria

**cingulate gyrus** part of the brain, which is involved in emotion formation

**cognition** mental processes, such as thinking

**concurrent validity** a way of establishing validity that compares evidence from several studies testing the same thing to see if they agree

**conditioned response (CR)** a behaviour that is shown in response to a learned stimulus



**conditioned stimulus (CS)** a stimulus that has been associated with an unconditioned stimulus so that it now produces the same response

**confederate** a researcher/actor who pretends to be a participant of a study

**confidentiality** participants should not be identified as part of the study. Their data can be anonymised

**confirmation bias** when a researcher conducts research in a way that confirms the intended outcomes

**conformity** a form of social influence where our opinions, beliefs and/or behaviour are influenced by a majority

**confounding variable** a variable that affects the findings of a study directly, so much that you are no longer measuring what was intended

**congenital blindness** blind since birth

**consequence** an outcome of something. In psychology, a consequence is something that follows the showing of a behaviour

**conspecific** a member of one's own species

**continuous reinforcement** the desired behaviour is reinforced every time it occurs

**control group** a group of participants that does not experience the experimental situation but acts as a baseline against which to judge any change

**control processes** conscious decisions about what to attend to from the sensory information in our environment

**corpus callosum** a band of nerve fibres that join the two hemispheres of the brain together and allow communication between the two parts

**correlation coefficient** a number between 0 and 1 which shows how much a change in one variable is related to a change in another variable

**cost-benefit analysis** a process that any study which uses live animals must go through to assess the benefits of the research against any harm or suffering which the animals might experience

**counterbalancing** alternating the conditions of the study for each participant in a repeated measures design

**covert observation** a form of observation where the participants do not know they are being observed. For example, you making an observation of behaviour in

your student area, while simply sitting in one of the seated areas

**critical/table value** a statistical cut-off point. It is a number presented on a table of critical values that determines whether the result is significant enough for the null hypothesis not to be accepted

**cross-sectional design** involves collecting data from a population or sample at a single point in time; the data is typically divided into groups or characteristics of a population

**debrief** a statement given to participants on conclusion of a study which discloses fully the nature and implications of the research

**deception** participants should not be lied to or misguided about the nature of the study

**deductive** a theory has been established and then tested to see whether it can be supported by data

**demand characteristics** participant behaviour altered because they may guess the study aim

**dendrites** branches at the top end of a neuron that receive messages from other neurons

**descriptive statistics** calculations which describe trends from raw data; these include calculating the mean, median, mode and standard deviation

**desensitisation** brought about by relaxation techniques taught before facing the phobic object

**digit span** how many digits can be retained and recalled in sequential order without mistakes

**directional (one-tailed) hypothesis** a directional hypothesis predicts the direction of difference or relationship that the result is likely to take

**double-blind** a study where neither the participants or the researchers collecting data are aware of who is receiving a treatment

**double-blind procedure** neither the participant nor researcher knows the aim of the study

**dual task experiment** experiments that involve two tasks that either compete with each other for the same cognitive resource because they are similar tasks (two verbal or two visual tasks), or involve different cognitive resources because they are different tasks (one verbal and one visual)

**Dynamic Visual Noise task (DVN)** a cognitive task used to study attention and perception, typically involving presenting participants with a screen with rapidly changing visual patterns, or 'noise'. Its purpose is to disrupt perception of other visual stimuli



**ecological validity** the ability to generalise the findings of experimental research to situations beyond the laboratory

**empiricism** knowledge can only be gathered through sensory experience. For example, empiricists would argue that you cannot infer that it is raining outside just because you can see people putting up their umbrellas; you can only establish that it is raining by going outside and feeling the rain on your skin

**encephalitis** inflammation of the brain causing damage to the structures of the brain

**endocrine system** the system of glands that secrete hormone messages around the body using the circulatory system

**episodic buffer** a subcomponent of the working memory associated with interfacing with long-term memory and integrating information from other subcomponents

**excitatory postsynaptic potential** the temporary depolarisation of a neuron as a result of positively charged ions flowing into the cell that make it more likely to fire an action potential

**experimental hypothesis** a prediction of the outcome of a study when conducting an experiment

**external reliability** refers to the consistency of a measure

**extraneous variable** a variable that may have affected the dependent variable but that was not the independent variable

**face validity** looking at each question and deciding whether it makes sense in terms of the construct being measured

**fascism** a very nationalist and authoritarian position, intolerant of others' views, based on an extreme right-wing political position

**field experiment** a piece of research that takes place in the setting where the behaviour being studied would naturally occur

**gamma rays** gamma rays are created when a positron meets an electron. A positron is injected into the body (FGD) and when it encounters an electron they converge in a process known as annihilation. This converts the mass of both the positron and electron into gamma rays. These gamma rays are detected by the scanner

**generalisability** the ability to apply findings to other people, situations and contexts

**generalised anxiety disorder** a long-term condition where individuals feel anxious in a range of situations rather than about a specific object

**glands** organs of the body that produce a substance that the body needs, such as hormones, sweat, or saliva

**habituation** the process by which a response to a given stimulus is seen to decrease with repetition

**hemispheres** two symmetrical halves of the brain

**hierarchical** a system of social organisation where there are leaders and those who follow

**hippocampus** a structure of the brain responsible for learning, emotion and memory

**holism** studying human mind and behaviour as a whole using different levels of explanation

**homeostasis** process by which the body maintains the internal environment, including blood pressure, blood sugar levels and body temperature

**hormones** chemicals produced by glands that are used to signal between organs and tissues

**human psyche** the human mind with all its conscious and unconscious aspects; thoughts, feelings, memories, and wishes

**hyperactivity** restlessness, impulsivity and excess of physical activity

**hysteria** an outdated term today, but used by Freud to describe physical symptoms without a clear medical explanation

**imitation** copying a behaviour that has been observed and remembered

**incentive** a monetary reward or other form of gift given to encourage participation in the study

**independent measures** an experimental/research design where different groups of participants are used in each condition of the study

**individual differences** natural variation in human characteristics that may exist between groups when using an independent groups design

**inductive** conclusions are drawn from the data to produce a theory

**informed consent** participants should be fully aware of the aims, procedure and implications of the research they are agreeing to undertake

**inhibitory postsynaptic potential** changes in the polarisation of a neuron that make it less likely to fire an action potential

**instrumental learning** the term Edward Thorndike originally gave to the form of learning where the consequence of a behaviour dictates the further repeating of it



**interference task** a task that prevents rehearsal, such as counting backwards

**internal reliability** refers to the consistency of a measure within itself

**internal validity** the extent to which a researcher is measuring what they intended and the outcome of the study is the direct result of the manipulated independent variable

**internal working model** a mental construct formed from our attachment experiences which influences our perception of relationships as stable/unstable, trusting/untrusting, secure/insecure

**interquartile range** a measure of dispersion that tells us the difference between the highest and lowest score for the middle half of scores in a data set

**inter-rater reliability** the degree of agreement and consistency between raters about the thing being measured

**interval/ratio data** data where an individual score for each participant is gathered, and the score can be identified using a recognised scale with equal distances between each score, for example time, height

**laboratory experiment** an experiment conducted in a controlled environment

**lateral** towards the side of

**law of effect** created by Thorndike, suggesting that behaviour with a nice consequence following it will lead to replication of behaviour. Behaviour with an unpleasant consequence following it will lead to it being withdrawn

**lesion studies** investigations into the effect on behaviour of damage to specific areas of the brain

**lesion** damage (either accidental or deliberate) to the brain that causes areas to die

**limbic system** a set of structures in the brain associated with drives, emotions and mood

**literature review** when a researcher reads, summarises and draws conclusions from other people's research

**lobes** specific locations in each hemisphere of the brain, frontal – is the front part, temporal is to the side and behind the ears, parietal is the top area and occipital is at the back of the brain. Brains have eight lobes, four in each hemisphere

**malevolent authority figure** someone who uses their authority for harmful purposes

**matched pairs design** where different participants are allocated to only one experimental condition (they do not do both) but are matched on important characteristics

**medial** situated in the middle

**melatonin** a hormone produced by the pineal gland which regulates the circadian rhythm

**meta-analysis** when a researcher gathers and analyses other people's data to look at effect sizes to draw conclusions about research in a topic area

**metabolic activity** metabolic activity in the brain is a chemical process where glucose is broken down and used as energy for brain function

**millivolt** one thousandth of a volt

**minority influence** a form of social influence where the opinions, beliefs and/or behaviour of the majority are influenced by a minority (individual or small group)

**mitochondria** site of aerobic respiration, where energy is released from glucose

**modality free** able to process different forms of information (acoustic, visual, haptic, etc.)

**moral strain** experiencing anxiety because you are asked to do something that goes against your moral judgement

**MRI scan** a brain scan that produces an image of the structure of the brain, similar to an X-ray but with more detail

**myelin sheath** fatty deposit that provides electrical insulation for an axon and allows electrical nerve impulses to be passed along

**naïve participant** a genuine participant, who is not a confederate of the study

**naturalistic observation** watching and recording behaviour in a natural environment where the observed behaviour would normally occur

**negative consent** when individuals are given the opportunity to decline to take part in research

**neonatal** relating to babies that have just been born

**neuroimaging** images showing the structure or function of the brain using scanners such as an MRI or CAT

**neuron** cell within the nervous system

**neurotransmitters** chemicals that pass messages between neurons

**neutral stimulus (NS)** an environmental stimulus that does not of itself (without association) produce a response

**nodes of Ranvier** gaps between adjacent myelin sheaths



**nominal data** where data forms discrete categories, for example hair colour can only be nominal data because it can only be described in its categories of, for example, blonde, brown, red, silver or black

**non-directional (two-tailed) hypothesis** a non-directional hypothesis predicts that a difference or relationship will be found, but not the direction that the difference or relationship will take

**non-participant observation** a form of observation where the researcher observes behaviour of others but does not form part of the group they study

**nucleus** houses the genetic material for that particular neuron

**null hypothesis** predicts no difference/relationship will be found or that any difference/relationship is due to chance factors

**obedience** complying to the orders of an authority figure

**objectivity** impartiality and value-free judgements should be made by the researcher. They should not impose their own opinions on the findings of research

**observed/calculated value** the value given by a statistical test, such as for the Spearman's rank test. It is compared with the relevant critical/table value to see if a null hypothesis should be retained or not

**operational definitions** what the variables are and how you will measure them

**operationalisation** defining the variables specifically so that they are directly tested

**order effects** the problem with presentation order of stimulus material. Participants may become practised at the test so improve performance or they may become tired so that performance deteriorates

**ordinal data** a level of measurement where numbers are rankings rather than scores in themselves, for example a rank order for attractiveness on a scale of 1 to 5

**overt observation** a form of observation where those being observed are aware of the presence of an observer. For example, an inspector coming into classroom to observe teacher/pupils

**oxytocin** hormone released by the posterior pituitary gland, which has been shown to increase trust between people

**paranoid personality disorder** suspicion and distrust of others

**partial reinforcement** the desired response is only reinforced some of the time

**participant observation** a form of observation where the researcher takes an active role in the situation being observed

**participant variables** natural variation in human characteristics

**passive-aggressive disorder** an unwillingness to engage in social and occupational activity

**perceptual code** a way of perceiving or interpreting information. In the context of Moscovici's experiments, when a minority consistently presents a viewpoint, it can challenge the majority's perceptual code

**peripheral oscillator** biological clocks in various organs and tissues around the body which are synchronised with the SCN to regulate the circadian rhythm

**PET scan** a positron emission tomography is a brain scan that allows us to see brain functioning

**pheromones** odourless chemical signals caused by biological processes

**phonological similarity effect** similar sounding words and letters are acoustically confused in short-term memory, making them more difficult to recall

**phrenology** practice of mapping the bumps on a person's skull and using these to deduce aspects of their character

**pineal gland** a brain structure which receives information about light and darkness from the environment. It responds to darkness by secreting melatonin

**pituitary gland** the small organ at the base of the brain, which produces hormones that control the growth and development of the body

**placebo** an inactive substance which has no impact upon biological processes, but may be perceived by the taker as having an effect; activity to measure the placebo effect

**placebo effect** improvement is shown because of an expectation of improvement

**postsynaptic neuron** the neuron where a chemical message travels to

**predictive validity** the extent to which results from a test or a study can predict future behaviour

**prefrontal cortex** the front area of the brain situated just behind the forehead

**presynaptic neuron** the neuron where a chemical message starts from

**privacy** participants should not be asked personal questions that they may find intrusive, and the researcher must not obtain personal data that a participant would not voluntarily disclose



**progressive muscle relaxation** in each session the therapist focuses the client on tensing and relaxing one particular muscle group to create awareness of tension and relaxation

**prosocial media** media that encourages helpful or appropriate behaviour

**prospective design** a study where researchers collect data from participants over a period of time to observe changes or trends

**psychopathic tendencies** lacking emotion and remorse, fearlessness and impulsivity

**qualitative data** descriptive data

**quantitative data** numerical data

**random allocation** participants are allocated to a condition of the study at random (names drawn from a hat)

**randomisation** randomising the conditions of the study for each participant in a repeated measures design

**range** a measure of dispersion that tells us the difference between the highest and lowest score in a data set

**receptors** sites on the dendrites that are designed to bond to and absorb a specific type of neurotransmitter molecule

**reciprocal model** something cannot happen in one part of the relationship without it affecting the other

**reconstructive memory** the idea that we alter information we have stored when we recall it, based on prior expectations/knowledge

**reductionist/reductionism** theory that explains a complex behaviour by isolated factors or a single cause, which ignores other important factors. The theory can be argued to be simplistic

**rehearsal** consciously rehearsing and repeating items

**repeated measures design** where all participants complete all conditions of the experiment

**resting membrane potential** the difference in electrical potential (meaning how 'ready' the neuron is for action) on each side of the cell membrane while the cell is at rest

**retrograde amnesia** the loss of ability to recall events prior to the injury

**reuptake** the process by which unused neurotransmitter molecules are absorbed back into the presynaptic neuron to be reused

**right to withdraw** participants should be offered the opportunity to leave the study at any point without

consequence. This means that they can withdraw their data after the study if they choose (up to a negotiated point in time)

**role models** significant individuals in a person's life. You are more likely to imitate role models such as parents or teachers

**schizophrenia** a major psychosis characterised by disturbances in thinking, hallucinations and delusions

**semantic dementia** a degenerative neurological disorder resulting in loss of semantic memory

**serial position effect** recall of information at the beginning and end of a list is higher than the middle of the list

**serial reproduction** a participant recalls information at increasing time intervals (for example, after ten minutes, a week, a month)

**single-blind procedure** to control for demand characteristics, participants may be unaware that they are part of an experiment, or may have been deceived as to the true nature of the study

**slave systems** the phonological loop and visuospatial sketchpad are referred to as slave systems because they play a subordinate role to the central executive, as such they serve the central executive which coordinates activity of the working memory. The term slave system is used in a technical (not historical) sense to illustrate the hierarchy within working memory

**social influence** how our opinions, beliefs and behaviour are influenced by the real or imagined pressure of an individual or group

**socialisation** the process by which we learn the rules and norms of society through socialising agents, such as parents and teachers

**specific language impairment** a condition in individuals whose language skills are much lower than other cognitive skills such as IQ and non-verbal abilities

**split-half method** splitting the questions into two halves and comparing the findings from both halves during analysis to ensure reliability

**spontaneous remission** recovery without treatment

**standard deviation** a measure of dispersion which calculates the average deviation of scores from the mean

**statistical significance** the probability that the data is a result of an actual relationship/difference existing between the variables rather than chance factors



**stimulation** artificial activation of brain areas often through use of electrodes giving off small electrical charges

**structured observation** watching and recording behaviour in an artificial environment, where a situation is manipulated to encourage a behaviour

**study** a practical investigation conducted by a researcher

**supramarginal gyrus** an area of the parietal lobe of the brain associated with the perception of language

**synaptic gap/cleft** the tiny space between the dendrite of one neuron and the terminal button of another where chemical messages can be passed

**systematic** gradually facing up to the phobic object via a hierarchy of exposure (from least fearful to most fearful)

**tachistoscope** a device used to present visual information in a controlled way, typically to test sensory memory

**temporal lobe** an area of the brain, called a lobe, situated below the ear

**terminal buttons/terminal boutons** very end of a neuron where the nerve impulse becomes a chemical message that can be passed to the dendrite of another neuron

**test-retest method** the same people are given the same questionnaire to complete again on a different occasion

**testosterone** principal male sex hormone and an anabolic steroid

**thalamus** part of the brain associated with sensory perception and consciousness

**thematic analysis** recording themes, patterns or trends within data

**theory** a set of ideas that are used to explain a behaviour

**token economy** a treatment method that provides secondary reinforcement for a desirable behaviour that can be saved up or exchanged for a primary reinforcer

**trepanning** surgical intervention in which a hole is drilled into the skull to treat problems related to the surface of the brain, such as epilepsy

**trigram** a set of three digits or letters

**type 1/type I error** when the null hypothesis is rejected and the alternative hypothesis supported when the effect was not real

**type 2/type II error** when the alternative hypothesis is rejected and the null retained when there was actually a real effect

**unconditioned response (UCR)** a response that occurs naturally without any form of learning (a reflex action)

**unconditioned stimulus (UCS)** any stimulus producing a natural, unlearned response

**unilateral lobectomy** the surgical removal of parts of the brain from one hemisphere

**utilitarian argument** applied to animal ethics, this perspective would argue that the interests and welfare of animals should be given equal consideration as humans

**vesicles** tiny sacs that contain molecules of neurotransmitter chemicals

**vicarious reinforcement** learning through the consequence of another person's behaviour

**visual array** an arrangement of digits or letters

**volunteer** participant who responds to an advert; this is called a self-selecting sampling method



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